The Builder.

Vol. XLIX. No. 2220. Saturday, August 22, 1885.

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The New Docks and Quays at Antwerp.

THE vast increase in the shipping trade of Antwerp of late years had completely outgrown the accommodation provided by its old quays and docks, in spite of the fact that they had been repeatedly enlarged and added to. Within the past twenty years Antwerp has risen from a third or fourth rate centre of commerce to the very first and largest port on the European continent. It has distanced all its old rivals, and has not only left behind Rotterdam and Amsterdam, but all the largest ports of France and Germany. It is now in advance of places like Hamburg, Bremen, Havre, Trieste, Marseilles, Copenhagen, Constantinople, and St. Petersburg. In 1850 the tonnage entering the port of Antwerp was only 250,000 tons. In 1865 it had increased to 750,000 tons, and in 1884 had reached the enormous figure of 4,000,000 tons. Ten years ago the Belgium authorities decided upon giving Antwerp the vastly-increased dock and quay accommodation its ever-growing commerce required. The practical realisation of the scheme commenced in 1877, and its completion was signalised by the great fête on the 26th ult., when the whole of the new quays and docks were inaugurated by H.M. the King of the Belgians. The sight presented to the English passenger, as he steams, in the Harwich boat, past the splendid sweep of the new quays, is one which it would be difficult to match in the whole world.

The old quay walls on the river, constructed bit by bit on very irregular lines, were ill adapted for any important trade. Except on the Quai du Rhin there were no means of working these river walls by railways, and they could not even be approached at low water, their footings being laid at low-water level: ships were either obliged to lie on the mud, or to keep at a distance from the walls. Eventually, the irregular form of the quays, a marked projection which occurred about the middle of their length, and the necessity of providing projecting jetties, produced a retardation in the river currents, and in consequence deposits of sand and many other inconveniences, whilst the ground available was insufficient for a complete and regular working of the traffic. It was, therefore, resolved to reconstruct the entire quays upon a regular curve, concave towards the river. This curve has a total length of 3,500 mètres, or two miles and one-fifth. At the same time, the creeks which divided the then existing quays were to be replaced by large floating basins for smaller vessels. The docks proving likewise insufficient, it was decided to lengthen one of them, and to add three new dry docks to the three already existing. The new quays have been executed by the State, but were furnished with the necessary appliances at the cost of the town; the other works on the docks were executed by the town alone. The portion to be provided by the State was contracted for in 1877 by Messrs. Couvreux & Hersent, of Paris, and comprised the following works.

Firstly, the construction of a quay-wall, two and one-fifth miles in length, resting on a sound foundation, laid without any timber footings, and giving a depth of not less than 8 mètres, or 26 ft. 3 in. of water against the face at low tide. In this wall there are three recesses, rectangular in plan, which are intended to accommodate floating landing-stages, and give access to boats. The landing-stages do not project beyond the line of the quay, and are made of iron, having a movable platform joined to the wharf by a movable bridge. Two of these landing-stages are 66 ft. long by 33 ft. wide, and the other 330 ft. by 66 ft.

The second portion comprises the building at the south end of this quay wall of an embankment connecting it with the land. This embankment is 2,130 ft. long, and is properly protected against the action of the river.

Thirdly, a basin for small craft had to be constructed, having an area of about ten acres, and divided into three parts; a lock, 42 ft. wide, connecting this basin with the Scheldt, and an entrance channel 160 ft. in width.

The works were divided into four sections, and the whole was to be completed within six years and seven months from the commencement. They included the provision and fixing of 12,000 tons of wrought iron for the caissons in the foundations, landing-stages, swing bridges, &c.; 375,000 cubic mètres, or 490,000 cubic yards of brickwork and concrete; 33,000 cubic yards of masonry in Soignies stone, and more than 3,300,000 cubic yards of earthwork in filling, dredging, &c. The cost was estimated at more than 38,000,000 francs, or 1,520,000*l.*, being augmented or diminished, according to an agreed schedule, with any augmentation or diminution in the depth of foundations which might become advisable. To this are added upwards of 60,000*l.* for any necessary additions to the work in the foundations. The first section of the works includes in the first place the new basins for small craft. These run parallel to the river, and are three in number. The central basin, from which branches the lock connecting them with the Scheldt, is 874 ft. by 213 ft., and the two others are respectively 807 ft. and 740 ft. in length, with a width of 164 ft. They are joined to the central basin by openings 33 ft. in width, each crossed by a swing-bridge carrying a roadway 17 ft. 3 in. wide and two footways each of 3 ft. 3 in. The bottom of the basins is 6 ft. 6 in. below the level of low water at Antwerp, and the coping of the walls 21 ft. above the same level. The total length of these walls is about 5,900 ft., or $1\frac{1}{8}$ mile. They rest at the bottom level on a layer of concrete 3 ft. 3 in. in thickness, and 16 ft. 6 in. in width, being enclosed by two rows of sheet piling. The wall, which is constructed of Boom bricks, is 27 ft. $4\frac{1}{2}$ in. in height, including the coping, 13 ft. $1\frac{7}{8}$ in. in width at the base, and 8 ft. $2\frac{3}{8}$ in. at the top. The wall has a batter of one in ten, and is faced with hammer-dressed stone from the coping to a height of 8 ft. 2^{2} in. above low-water. The quay-space of these basins has a width of 98 ft. The walls are furnished with cast-iron mooring-posts, with cast-iron fenders, and wrought-iron ladders, whilst the basins are kept filled to a level of about 12 ft. above low-water. The lock between the central basin and the Scheldt is built partly in the river and partly upon dry ground. It is composed of three distinct and separate portions. In the first place, there is the upper lock, with a sill of masonry 1 ft. above the bottom of the basin, and resting on a foundation of concrete 8 ft. $2\frac{3}{8}$ in. in thickness. In width it is 42 ft. 6 in. between the side walls, and is crossed by a swing-bridge, 28 ft. wide, which is intended not only for horse traffic, but likewise for the railway which serves the quays on the Scheldt. This lock was constructed between two rows of sheet piling, and behind an earthen cofferdam connected at each end with the original banks of the river. It has a pair of gates opening inwards, arranged for receiving, if at any time necessary, a similar pair opening outwards. In the second place, there is the lock-chamber, 246 ft. by 82 ft., whose walls are similar to those of the basins, only they are entirely faced with ashlar. The invert rests on a layer of concrete, a little over 3 ft. in thickness, with its surface 6 ft. 6 in. below low-water, and is surrounded by sheet-piling. Lastly, there is the lower lock, which contains two pairs of gates, and has its invert level the same as that of the chamber. The side walls, which are 42 ft. 6 in. distant from each other, are crossed by a swing-bridge of the same dimensions as that across the upper lock, and carry a roadway with two lines of railway.

The chamber and lower lock had to be constructed almost within the area of the Scheldt. The contractors purposed to make the lower lock form part of the coffer-dam which should shut in the lock chamber to be built behind it, instead of building a coffer-dam in the river,

so as to proceed with both at the same time. With this object they constructed the entire lower lock *in situ*, and in one piece, upon an immense caisson, sunk, by means of compressed air, to a depth of 21 ft. below low-water level. This caisson was 131 ft. by 75 ft. 6 in., having an area of 920 square mètres, or 9,890 square feet, whilst its total height was 42 ft. 6 in., making the contents 11,960 cubic mètres, or 420,000 cubic feet. It was divided longitudinally inside the roof into five working compartments, which were completely independent of one another, each having its own air-lock and tubes for concrete. The walls of the caisson were joined near the top and above the girders by cross-girders of iron. The caisson was erected upon the banks of the Scheldt, in a place protected from the tide by an earthen embankment. After being completed the embankment was cut through on the side nearest to the river, and the tide entering floated off the caisson, which was then towed, without fear of damage, to its proper position. In August, 1878, the sinking was commenced, and was completed by November of the same year. The masonry having been carried up a certain distance, it was then connected with the bank at each end by an earthen embankment. A vast base was consequently formed, which required only to be pumped dry in order to commence the foundations of the lock-chamber. Upon the completion of the chamber and locks, all that remained was to remove the iron barrier across the end of the lower lock nearest to the river, by cutting the rivets and unbolting the wrought-iron knees which supported it. The six gates belonging to the entire lock are all of wrought-iron, and made without rollers ; the lowering of the water is effected by means of sluices in the side walls and valves in the gates themselves. Between the lower lock and the line of the new quay is an entrance-channel 164 ft. in length, and as many feet in width, which is intended to shelter boats from the river current as they enter or leave the lock. The bottom of this channel is 8 ft. below low-water, its walls being constructed upon caissons sunk by compressed air to depths varying from 34 ft. 6 in. to 41 ft. 6 in. below low-water.

The quay wall has been built within the bed of the river by a special system of movable coffer-dams. It is constructed of Boom bricks, and faced with Soignies stone ; the coping level is 21 ft. above low-water, and the total height is 47 ft., whilst the width is a little more than 6 ft. 6 in. at the top, 20 ft. 6 in. at low-water level, and 23 ft. at the base. It has a batter of one in twenty from the coping to low-water level, and one in ten from thence to the foundations. The upper part of these foundations is at a level of 26 ft. 3 in. below low-water throughout, and has a breadth of 29 ft. 6 in. ; the depth varies between 8 ft. 3 in. and 16 ft. 6 in., according to the depth of the river bed, so that the bottom of the foundation is from 34 ft. 6 in. to 42 ft. 9 in. below low-water. The difficulty of carrying out such works in the Scheldt was exceedingly great ; the sandy nature of the bottom, the speed of the current, and the great rise of tide, are all adverse circumstances. It became necessary to build a continuous quay-wall with its foundations 34 ft. to 43 ft. below the low-water level of a rapid river, rising twice in the course of the day to more than 13 ft. on the average above this level, and frequently at high tides to 21 ft. The method adopted by the contractors was as follows :—They divided the total length of the quay into lengths of 82 ft., which have been built end to end, and directly upon firm ground, without any intervening foundations. This has been accomplished by means of a special coffer-dam used for the first time on this occasion, and with most complete success. It is composed of the following parts :—

1. An iron caisson for compressed air, varying in height according to the depth at which the foundations were to be laid, and intended for removing the soil and laying the base of the wall.

2. A movable iron cofferdam, 40 ft. high, having the same shape as the caisson which supported it, and with which it was connected by bolts. Within this cofferdam the part of the quay wall was built 26 ft. 3 in. in height, which is comprised between the top of the foundations, properly so called, and the level of low water.

3. A floating framework, designed for the manipulation of the coffer-dam, and for the placing and sinking of the caisson. The caisson served for the removal of the earth, and was then filled with concrete, and became an integral part of the foundations. The masonry having been built on the top of this up to low-water level, under the shelter of the movable cofferdam, it became possible to remove the cofferdam by unbolting it from the caisson and raising it by chains fixed to the floating framework. It was then taken away to serve the same purpose for another length of wall, while the length so far constructed by its means was finished in the dry.

The caissons were built in yards on the bank of the river, and were launched at high water, when they were towed to their destination underneath the movable coffer-dam, being bolted to the latter, with a layer of india-rubber placed between the two. The weight of a caisson, 82 ft. by 29 ft. 6 in., varied from 65 tons to 100 tons, according as the height is 8 ft. 3 in. or 16 ft. 6 in. The movable coffer-dam was composed of a large wrought-iron rectangular box, 82 ft. by 29 ft. 6 in., and 40 ft. in height. To prevent any deformation of the walls of the coffer-dam under the pressure of the water whilst the building of the masonry was going on inside, they were connected with each other by strong movable stays, which were removed as the work proceeded, being replaced by shorter stays bearing against the face of the wall already constructed. The coffer-dam, complete, with all its apparatus, weighed about 200 tons.

The floating framework was composed of two iron barges, 85 ft. by 16 ft., upon which were built frames of iron braced diagonally, and connected at a height of 43 ft. above water level by cross-girders, being also connected by a similar framework at the two ends. The cofferdam was suspended by twelve chains in the space between the two barges, and could on this account be raised or lowered at will by means of hoisting gear, consisting of six winches in each barge, all twelve being worked by one steam engine. The power was transmitted from one barge to the other by means of two pitch-chains. Uniformity of lifting with the twelve lifting chains was secured by indiarubber springs, and each tackle had a lifting power of about 20 tons. In the hold of the barges were the steam engines for working the cofferdam and the air-compressors, with the pressure and exhausting pumps. On deck were mortar-mixing machines, and others for handling the materials. Four Jablochkoff electric lamps were placed on each framework for working by night. The method of working with this apparatus was as follows :—

The site for the caisson was first dredged to the proper level, and the caisson then brought up to the floating framework with its roof loaded to the top of the girders with concrete, which ultimately formed part of the foundation. The coffer-dam was lifted until its bottom edge was about 3 ft. 3in. above water-level, when the caisson was brought in under it and the coffer-dam lowered upon it, and the two bolted together. The masonry was then commenced on the top of the caisson, so as to load it with the necessary weight, whilst at the same time the air-tube and the four concrete tubes were attached to it. The bottom of the Scheldt is generally composed of sand, more or less argillaceous, and of loam earth. Under these circumstances the work of removing the earth excavated has been considerably facilitated by the use of ejectors, as employed for the first time by the same contractors at Selzaete Bridge on the Terneuzen Canal. Each ejector can easily discharge 2·6 cubic yards of earth per hour.

The sheds cover an area of about 25 acres. The total width of the new quays is 328 ft. To obtain this width it has been necessary to pull down more than 600 houses, the purchase of which has cost upwards of 25,000,000 francs, or 1,000,000*l.* sterling. The total cost of the quays, including machinery, earthworks, dredging, paving, works above ground, and property purchased, is no less than 80,000,000 francs ; that is, 3,200,000*l.* sterling.

The operations at the new quays are carried on by hydraulic machinery. For this purpose steam pumping-engines of 400-h.p. have been placed in a building near the southern basin for small craft. From this building a line of pipes is laid, passing round the small craft basin, and along the first section of the quays. This first section is worked by twenty-two portable hydraulic cranes. The construction of the three new dry docks situated at the north end of the quay has required 28,700 c. m., or 37,540 cubic yards, of brickwork, and nearly 5,000 c. m., or 6,540 cubic yards, of hewn stone, while more than 100,000 c. m., or 130,800 cubic yards, have been excavated. The large dry dock previously existing is emptied by means of pumps, capable of drawing 200,000 litres, or 44,000 gallons per minute. It was desired to make the same pumping-engine serve for the new dry docks, but there was great difficulty in so doing, from the fact that the conduit leading the water from the new docks to the engine was obliged to pass below the existing docks. For this purpose a tunnel, about 300 ft. in length, was driven, and lined with cast-iron tubing. A well was first sunk by means of compressed air, and the driving of the tunnel was carried on by the same means, the successive lengths of cast-iron tubing being bolted on to one another, and the water kept back by the pressure of the air. This operation succeeded perfectly, and the extremity of this tunnel has been united with the head of each of the dry docks.

The northern docks are also worked by hydraulic machinery. A special building contains a 150-h.p. steam-pumping engine and boilers, and two accumulators weighing together 240 tons. This engine supplies water pressure to the movable and other cranes round the docks, the bridge and gate machinery, and capstans for hauling ships, &c., as well as to the hydraulic engines which drive the dynamo-electric machines for lighting the entrance of the old docks. Among the machines worked by this water-pressure may be mentioned a 40-ton crane altered to the hydraulic system, and sheer-legs capable of lifting 120 tons. These are on the eastern wall of the Kattendyke basin, the lock of which is crossed by a draw-bridge, having a length of 158 ft., carrying a roadway 90 ft. wide, and weighing 375,000 kilograms, or 370 tons. In order to open this bridge it is raised about 3 ft. 3 in. by means of two hydraulic rams 2 ft. 7 in. in diameter, and is then drawn back by chains which are worked by rams 2 ft. in diameter. It can be completely opened in three minutes twenty seconds, and closed in two minutes ten seconds.

CLOCKS IN RELATION TO ARCHITECTURE.—I.

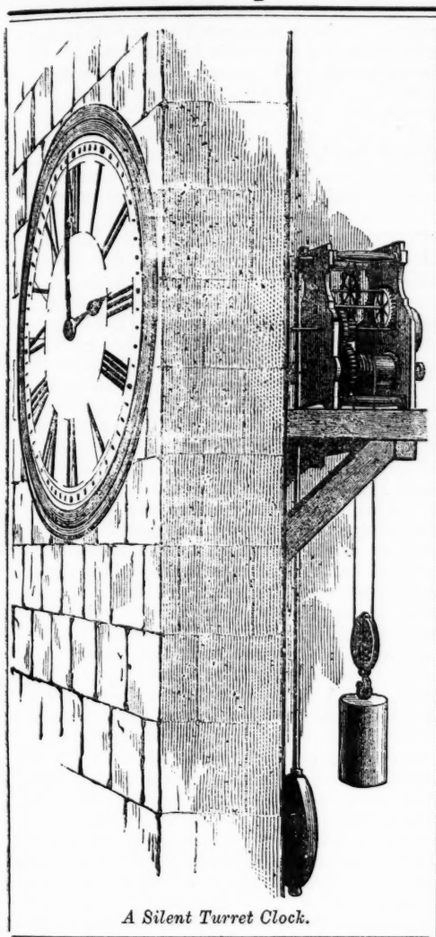
BY A PRACTICAL CLOCKMAKER.

ALTHOUGH turret clocks cannot be said to belong to architecture, yet their association therewith is so intimate, that some jottings on the subject from a practical standpoint may not be out of place in a journal devoted to architectural interests.

No tower, whether of church, town hall, or other public building, can be considered complete without a suitable clock, for passers-by almost instinctively look up to see the time, and are naturally disappointed if there is no clock to show it. Indeed, the *raison d'être* of a church tower is to contain the bells, and the clock follows as a matter of course.

This primary purpose of the existence of a tower we find in many modern buildings entirely ignored ; no provision, or at best a most inadequate one, being made for a clock of due proportions, suited to the size and importance of the structure.

Take a few instances at random. The important parish church of Kensington has, indeed, a clock, but it is invisible, and time is



A Silent Turret Clock.

The drawing represents a "silent" turret clock of the most simple construction, having the following

Train of Wheels:—

MAIN WHEEL, turns once in 4 hours, and has teeth — 80 gears into ..... Pinion of 20 leaves.

CENTRE WHEEL, turns once an hour, carries the minute hand, and has teeth — 64 gears into ..... Pinion of 8 leaves.

THIRD WHEEL, turns once in 7½ minutes, and has teeth — 60 gears into ..... Pinion of 8 leaves.

ESCAPE WHEEL, which drives the pendulum, turns once a minute, and has teeth 30

given by sound only, the architect having allotted no space for dials. In a busy thoroughfare like this, a clock with face and hands would be of the greatest public convenience, especially as it is by one of the first makers, an exact time-keeper, and cost 1,000*l*. The better half of the usefulness of the clock lies barren and idle, and its value is to a large extent sacrificed.

At St. John's, Hammersmith, there has recently been erected a new tower of fair proportions, and a bell-chamber and an opening for a clock are provided, but the circular space is far too small. The elevation being 60 ft. the minimum size of dial should be 6 ft. in diameter. The space actually allotted does not exceed 3 ft., which will make the clock out of proportion with the building, and too small to be of much service.

Lower down on the same road, the conspicuous church on Turnham-green presents the ludicrous spectacle of a dial stuck half-way down, and in front of an unglazed window-space at the base of the spire,—as if to form a sort of shutter,—the bell-chamber being below, the cart before the horse. In this case, the architect had never contemplated the necessity for a clock, and the present awkward, ineffective arrangement,—the dials being far too small for their elevation,—is evidently a make-shift and an afterthought.

Wren's treatment of church towers was very different to that adopted in the cases quoted, for we find that in his plans adequate provision is made for the clock, which is *part of the design*, blending with it, and forming with the building one harmonious whole. Surely it does not require the genius of Wren to do this in modern structures. Examples may be seen in St. Paul's Cathedral (south-west tower), Bow Church, Cheapside (two dials, 9 ft. in diameter, at an elevation of 70 ft., one of the most effective clocks in London); St. Bride's, Fleet-street; and many others.

In these cases the clock and bell-chamber, so far from detracting from the symmetry of the architecture—an excuse sometimes made when the former have been neglected or forgotten,—rather improve it, as will be evident on the most cursory inspection of the churches last mentioned.

Turret clocks, like other things, have not escaped the influence of the modern spirit, which demands a perfection hitherto unexpected. Formerly allowance was made for the difficult conditions under which the clock worked. The disturbance of the hands by wind or snow,* the exposure of the movement (popularly known as "the works") to damp, dust, and grit, the effect of the weather on the oil and the metals, the action on the pendulum of extremes of temperature and other adverse influences were taken into consideration, and the clock was excused if its time-keeping were irregular, as was generally the case. The variation of a few minutes was, from the absence of true time in the neighbourhood, perhaps, never detected, or else condoned as the best to be expected, and of no practical consequence, as the mistake would be rectified at the next periodical winding. Indeed, allusion is made by old writers to the custom of allowing a quarter of an hour for the "difference of clocks."

There is no doubt that railways and the electric telegraph have indirectly done much to raise the standard of time-keeping; for the service of trains is regulated by Greenwich time, received daily by telegraph at the terminus, and thence transmitted to the various stations.

Exact time being now required, turret-clocks as the public standards are expected, no matter how exposed their situation or how large their dials, to keep an accurate rate, and not vary as many seconds per week as their predecessors varied minutes. This necessary condition ought to be stipulated for in all orders for new clocks, and makers of repute are prepared to comply with such a requirement.

Turret-clocks are not simply house clocks on an enlarged scale, differing from them merely in size and weight, but the extra strength of the mechanism involves greater weight of material and increased weight implies increase of friction. It is of the first necessity to provide ample space for the fall of the weights and the swing of the pendulum, in order to make the clock thoroughly efficient and a good timekeeper.

The movement which has to be placed at some distance from the dials must be more powerful than one in close proximity, and forethought on the part of the architect will save expense both in the original cost of the clock and its subsequent repair. Unless sufficient space be provided, it is, indeed, impossible to have a first-class clock that will give satisfaction to its owners and be a credit to its makers.

The popular idea is that a clock is too complicated a piece of mechanism to be understood by any but those engaged in its manufacture, whereas, in reality, its design is extremely simple, consisting of four wheels and three pinions, *i.e.*, very small wheels, the teeth of which are called "leaves."

The action will be readily understood from the drawing and diagram of the "train of wheels" given above.

Each wheel, excepting the main-wheel, has a pinion (small wheel) on its arbor or axle. To the main wheel is attached a drum, which carries a weight to supply the motive power. The pendulum, we will suppose, oscillates once a second, it will, therefore, take a double oscillation for each tooth to pass the pallet, consequently the escape-wheel, with thirty teeth, will revolve once a minute.

There is no arbitrary rule for the numbers for the teeth, which can be varied so long as the due proportions are retained. As the escape-wheel turns sixty times to one turn of the centre wheel, the method for determining the numbers will be as follows:—Multiply the teeth of the intervening wheels (viz., the centre and third) and divide the product by that of the leaves of the pinions similarly multiplied, and the result, if the train is true, must always be sixty. This we shall find to be the case in the present instance:—

$$\frac{\text{Centre Wheel } 64}{\text{Third Wheel Pinion } 8} \times \frac{\text{Third Wheel } 60}{\text{Escape Wheel Pinion } 8} = 3{,}840 \text{ divided by } 64 = 60.$$

In like manner, the rate of motion of the arbor or axle which carries the minute-hand has to be reduced for the hour-hand, which is set on a pipe through which the centre arbor passes. This is done by two pinions and two wheels, the pinions in this case driving the wheels, and not *vice versâ* as in the movement. The leaves of the pinions when multiplied must be one-twelfth of the product of the teeth of the wheels, because the minute-hand turns twelve times to one turn of the hour-hand.

The best clocks are usually made with wheels of gun metal or hardened brass, the teeth being divided, cut, and polished by steam machinery, and finished without the aid of the file, emery paper, or other polishing materials, so that the most minute difference is prevented and accuracy insured to the one-thousandth part of an inch. The pinions should be of hardened steel, cut from the solid, and made in the same manner as the wheels.

In cheap clocks, constructed chiefly for public companies who give their contracts to the lowest tender irrespective of quality, iron is frequently used instead of steel, both for the pinions and arbors (axles), and cast-iron takes the place of gun metal or brass in the wheels and bushes. These clocks are generally the production of firms who combine engineering with clock-making, and are naturally anxious to make one plant serve two purposes, notwithstanding the dissimilarity of the two pieces of mechanism under manufacture.

The result is that clocks thus made are faulty time-keepers, and that, owing to friction, rust, and brittleness,—for iron wheels, however well made, are very liable to chip or break, or to oxidise and decay,—such clocks have, in a comparatively short space of time, become worn out and useless.

This opinion as to the unsuitability of cast-iron has been, I am aware, controverted, although no amount of argument can alter the facts, which are as stated.

It has, however, been said that "as soon as you cut off the friction of the train from affecting the escapement, it is obvious that cast-iron wheels are just as good as brass or gun-metal." But it is not so. You never can prevent the friction of the train from affecting the escapement,—*i.e.*, that part of the clock which regulates the discharge of the power imparted by the main wheel. [This will be more fully explained in the succeeding article.] The celebrated Ferdinand Berthoud has proved in the case of watches, that "no escapement can have any influence over the main-spring, and consequently that it cannot correct the inequalities of the motive power

* This is not a fanciful supposition. The snowstorm which occurred early on Sunday morning, 22nd of March of the present year, stopped the great clock at Westminster and more than half the public clocks in London, the accumulation of snow on the hands overpowering the clock. Even in cases where the clock was not stopped, the hands would be retarded in their progress and thereby cause a loss of time.

from being transmitted to the balance, whose velocity is retarded or accelerated in conformity with the irregularities of the main-spring." And the same is true as regards clocks, any variation in the uniformity of the motion of the train, communicates itself to the escapement and thence to the pendulum.

Moreover, the action of the escapement is (as we shall see in a later paper) to regulate the time, and not to correct defects in the mechanism, and to require from the former results it was not designed to give, can only end in disappointment.

A further argument is that cast-iron wheels, with smaller teeth than any used in turret-clocks, are successfully employed in spinning machinery; but it is evident that the cases are altogether different, for the motive power in the latter instance is steam, the great force of which will drive the machinery even when the wheels are somewhat defective; besides, the evenness of the rate of motion is unimportant, provided the machine does the work assigned to it.

But in clock-work, none of these conditions obtain; the motive power, derived from the descent of a weight, is, compared with steam, very weak and consequently altogether inadequate to resist the inertia of defective wheels, whilst an even rate of motion is of the highest importance and its absence would render the whole machine useless.

The most inexperienced person will see that wheels cut from the solid metal, hard and close in texture as gun metal or brass, must be more efficient and reliable than cast-iron, the roughness and other defects of which are well known.

So far from brass corroding, as is sometimes asserted, in town atmospheres, old clocks may be seen with brass wheels that have been in action for more than 100 years and are still perfectly sound and good.

It must be borne in mind that the efficiency of a clock depends no less upon the materials and workmanship than upon the plan of construction; for if the metals used are liable to wear away by friction, or corrode by damp, the most perfect design in theory will fail in practice.

The same is true as regards workmanship; unless the various parts are made with the greatest accuracy, all roughness removed from the edges of the teeth, and the surface of the acting parts made smooth and clean, friction is inevitable, and the clock soon cuts itself to pieces.

Too much care, therefore, cannot be given to details of manufacture, as an apparently slight defect in execution will be sufficient to spoil the uniformity of the rate of time, and thus detract from the efficiency and value of the clock.

The introduction of steam machinery has added to the accuracy of clock-work, and at the same time considerably diminished its cost. A turret clock can now be produced for the sum of 150*l.*, which will excel in superior construction and accurate time-keeping one that half a century ago would have cost 800*l.*, and the practical result is seen in the largely-increased number of public timepieces.

As the purchaser of a clock is not usually in a position to judge of its merits, he must rely upon the reputation of the maker, who, if he is an actual and *bonâ fide* manufacturer (their number is very limited), and not a mere clock-seller, will be able to refer to public clocks erected by him in different parts of the country, so that independent inquiry can be made as to the efficiency of his instruments.

The winding of the clock seems a simple affair, and yet special precautions have to be taken not to derange the working of the machine.

If the drum which carries the weight were part and parcel of the great wheel, the winding would reverse the action, put back the hands, and utterly disorder the instrument. To prevent this, the drum has a ratchet or saw-toothed edge, into which fits a stop falling from the inner edge of the great wheel, and kept in its place by a spring: so that, turning in one direction the drum will drive the wheel; turning in the other it is free, the stop slipping over the teeth in a somewhat similar manner as the pall in a windlass or capstan. By this means the revolution of the great wheel during winding is left undisturbed.

A second point to provide for is the *continuation* of the motion. As the act of winding takes the motive power off the great wheel, it is obvious the clock would stop, and the action of the pallets (for the swing of the pendulum would go on for some time after the stoppage of the train) upon the finely-cut teeth of the motionless escape wheel, would probably injure them,—unless some means were found to continue the action until the motive power is restored. This substitute, technically known as the "maintaining power," is of the greatest importance in large clocks, the winding of which takes some minutes.

The mechanism employed by the best makers is of a simple character, yet thoroughly effective and reliable. Its action is as follows:—To gain access to the winding square on which the key fits, the attendant must first raise a lever, one end of which, being wedge-shaped, gears, on being thus raised, into the teeth of the great wheel, and the other, being sufficiently weighted, supplies the motion. The winding completed, the lever gradually drops, with the revolution of the wheel, into its old position.

The important question of "escapements," the different kinds now in use, and their respective merits, will be fully discussed in the next article.

NOTES.

THE memorandum which forms the instruction for the Royal Commission on the Depression of Trade covers a field so immense that the labours of the Commission on the Housing of the Working Classes shrink almost to nothing in comparison. At the same time, while concentration or orderly grouping of the subjects of inquiry is loudly called for, there are many matters of extreme interest to the working people, of every class, for investigating which there seems to be no direct provision. Such, for example, is the effect on the building trade of the importation of ready-made doors, sashes, hand-rails, and other wrought woodwork required for houses. That this importation has disorganised and thrown out of work a large number of persons formerly in constant employ, there is no doubt whatever. What are the countervailing advantages to the trade, to the house occupier, and to the country, it is important to ascertain. In cases of this kind true statesmanship requires to know the balance of profit and loss to the country. It is just this which the advocates of foreign labour have failed to show. This is only one case out of many; but it will be seen that the real gist of the work of the Commission, in order to be of use, is thus indicated. A certain gain may be effected by having recourse to foreign instead of to home labour. But the true point to ascertain is what, in each individual instance, is the net balance of gain or loss to the country, taking all things into account.

THE model of the design for the proposed New War and Admiralty Offices is on view at No. 18, Spring-gardens. In addition to the shifting of the tower, so as not to overpower the Horse Guards so much, the principal visible alteration is that the columns of the order on the Park front are pushed back on the wall so as to be quarter engaged, and, therefore, they and their stylobates project less, and do somewhat less useless work, and obstruct less light, than they would otherwise have done. The order is still out of proportion to its base and attic; the balustrades still display three different scales in different portions of the elevation; the building is still all over pots and pepper-castors. In short, the design, in model as in drawing, appears as what it is,—a piece of mere commonplace from base to cornice, without a spark of genius in it. That is what the judgment of Parliamentary professors of architectural taste has done for us. The narrowness and vertical depth of the central court, which, as a sanitary matter, has been commented upon both in our columns and elsewhere, is forcibly brought out in the model. We presume the work will be carried out in this form, as we are told it has received the final sanction of the authorities; but it will interest none who have any perception of the higher possibilities of architecture, and will remain, if carried out, a monument of a great architectural opportunity thrown away.

THE Great Western half-yearly meeting on the 13th current had the special interest of being the hundredth meeting that company has held. At the first of these, the capital of the company represented 2,500,000*l.*, which had provided for 114 miles of railway, at a cost of a little under 20,000*l.* a mile. It now represents 90,000,000*l.*, covering the construction of 2,300 miles of line, which have therefore cost a little over 39,000*l.* per mile; the length of the undertaking having been multiplied by twenty, and the cost of each mile nearly doubled. It would be difficult to bring more succinctly before the public an illustration of that double growth in our railway capital to which foreign statists look with alarm. To increase the length, ought to be to increase the value, of the property. But it may be another thing to increase cost per mile. This is the more worthy of note when we find that over this great system 1,065,232 fewer passengers were carried in the last than in the preceding twelve months, with a loss of gross revenue of 32,182*l.* This gives an average fare of about 7½*d.* per passenger, but no light is thrown on the question of cost of carriage. The percentage of working expenses over the whole line stood at the unusually low figure of 50·79, which is considerably less than that of the competing Northern lines. The good gradients of the Great Western Railway are a source of economy in working. But the percentage of cost really tells us nothing unless we are also informed of the average rate of fares and freight. And fares are certainly higher on the Great Western than on the Northern railways. If the Great Western Railway Company were to turn their attention to the proper development of the traffic on the 280 miles of canal, we should have less chance of reduction of dividends in the future.

THE seventy-eighth half-yearly report of the Great Northern Railway very forcibly illustrates the inconvenience, to say the least of it, of the present loose mode of keeping railway accounts. During the half-year there has been an increase of no less than 186,533 passengers, accompanying a decrease in passenger receipts of 9,682*l.* on this line, In any ordinary business an explanation of such an anomaly would be the first care of the proprietor. But so far are the directors of this line from being able to explain the falling off in their income, that the chairman stated that "it would be impossible to know what would be the financial results" of a partial abolition of the second-class traffic. If, as on most railways out of England, the company had taken steps for ascertaining, first, the average distance for which a passenger of each class was carried; and secondly, the cost of the passenger traffic, as distinct from that in merchandise and minerals, this undesirable condition of ignorance would have been removed. In the first place, to say that there is an increase of 186,000 passengers, tells the proprietors nothing, unless it be added at what increase or diminution in passenger mileage this is attained. In the next place, unless it be shown at what working cost the passenger revenue has been earned, it remains obscure whether the decrease of 9,682*l.* in gross revenue is a decrease also in net earnings or otherwise. It is possible that the removal of 9,456 passengers from the second to the third class, while diminishing the gross, has improved the net income. At all events, it is highly unsatisfactory that no information should have been collected to show whether or no this were the case. While the happy-go-lucky mode of making experiments on traffic continues dividends are likely to decline.

BY degrees we appear to be arriving at some rather more definite understanding of how to purify water from the various organisms that tend to pollute it. According to Messrs. Austen & Wilber, alum has an excellent effect, both in clarifying and removing disease germs. Sixty litres (about thirteen gallons) of turbid drinking-water were treated by two grains of alum, the result being the formation of a precipitate and a perfectly clear water after forty-eight hours, with the merest trace in it of aluminium. Dr. Frankland finds that of the various filtering materials, the best were green sand, coke, animal charcoal, and spongy iron, every one of these completely removing micro-organisms from the water, the only drawback being the limitation of the time during which the filtering power remained intact. After a month or so the materials lost their vigour, and had to be renewed, although coke has the advantage of rather stronger action when agitated in the water, the organisms disappearing entirely, without the chemical composition of the liquid being in any way altered. Dr. Frankland also found that the greatest number of organisms were always to be met with in the upper layers of stagnant water, instead of, as might be expected, their subsiding to the bottom. Another bad habit of water has been successfully coped with, although in this case it was not for drinking, but for manufacturing purposes. Incrustation of pipes is a familiar difficulty to engineers, and one that often causes untold trouble. A case occurred at Leipsic in which the interior of the force main from the pumping-station to the reservoir was nearly filled up with an incrustation about 8 in. thick. The intruder was treated with dilute muriatic acid on eight different occasions, followed by soda solution three times, and chloride of lime solution once, after which the pipe was washed out thoroughly with water. The result was that the incrustation was completely removed, and the pressure gauge showed a decrease of nearly two atmospheres at the pumps.

IT is not very often that we see amongst the shoals of prospectuses of new companies anything of a really utilitarian kind, although pseudo-philanthropic schemes are not uncommon, in which the philanthropic element is, at all events, intended to serve at least one person, — the promoter. A *rara avis*, however, has recently appeared in the shape of a proposal to establish a training college or colleges, solely for the instruction of young men intended to follow out a colonial life. Considering the enormous numbers of the youth of England that annually leave the country to gain their livelihood in British colonies or the United States, it is marvellous that no systematic effort has been made until now to educate the colonial aspirant in some specific manner. Almost every professional branch has its own establishment, where the distinctive features of that profession may be grafted upon the more general education acquired beforehand; but lads are pitchforked into the colonies with little or no preparation, save a few courses of agriculture or a month or two of engineering study. While we should not deny the advantage of an ordinary general education as a basis for all others, the profession of colonisation demands an extraordinary amount of practical knowledge, the acquirement of which can scarcely begin too early; and the reason why so many young emigrants are returned upon their friends' hands as so many bad shillings, is not that the colony has no room for them, so much as the lack, on the part of the new arrivals, of knowledge as to what they can turn their attention to with the greatest prospect of success. Agriculture, with all its various subdivisions of details, veterinary surgery, forestry, geology, and mining, are subjects with which every would-be prospector of a new country should be fairly well acquainted, while a knowledge of the more practical trades, such as building, carpentering, cooperage, wheelwrighting, engineering, tailoring, or cooking, are all equally indispensable; and any young man who goes out with a tolerably good idea of being able, at a pinch, to do most of these things, may be said to carry his fortune in his hand, far more than one who has only the recommendation of a few hundred pounds and no knowledge.

WITH the increase of town populations and of railway facilities, land on the sea coast becomes yearly more valuable. A somewhat curious example of this fact is shown in the recent litigation in the case of the Attorney-General *v.* Reeve, which was a proceeding by the Crown to establish its right to a tract of land, 1,200 ft. in width, at Lowestoft, which had been formed by accretions from the sea in the course of the last forty years. This land was required for the purposes of a dock; but there must be similar pieces on the east coast of England which in process of time will be required for promenades for watering-places, and for similar purposes. The principle of law which solves the question of the ownership of such ground as this is very old, and is to be found in the most ancient writers on the English common law. An accretion of land by the action of the sea is the property of the Crown, as, being once beneath the sea, it at one time belonged to the Crown. But if the accretion be very imperceptible and undiscernible by limits and marks, then the accretion belongs to the owner of the adjoining land. In the present case numerous witnesses were produced by the Crown, who testified to the marked increase of the land, and the diminution of water in a perfectly perceptible manner. Consequently, applying the old principle, the Court pronounced for the claim of the Crown against that of the freeholder. No one who regards this new supply of land as a kind of bonus at the hands of nature can consider that the freeholder has any more right to such land than any other member of the English nation. On the other hand, land which thus comes into the possession of the Crown should be used so far as possible for the benefit of the localities. Land such as this, which is to be used for a dock, should be sold or let at a low price, and the results employed for the benefit of the locality. The subject is one likely to come more into public notice for the reasons which we have already pointed out.

NOTWITHSTANDING the assertions of eminent sanitary engineers that the whole of the Thames Valley is destined to be sooner or later drained by one gigantic combined scheme, many of the Local Boards along the valley are still making praiseworthy efforts to make their separate schemes as perfect as possible. As we mentioned recently, Chiswick has spent a considerable sum in introducing into its works sludge presses, forming the sludge into dry cakes, and so obviating objectionable accumulations of that material; and that parish is now, for the purpose of flushing the sewers, erecting in each of the manholes an automatic syphon which it has tested carefully by experiment. The Brentford Local Board, following in the footsteps of that of Chiswick, are about to add to their sewage system the sludge-presses and the automatic flushers. Acton, as we also pointed out some time ago, has just concluded a seven years' contract with the "A B C" Company for the clarification of the sewage of that parish at the works about to be constructed. Acton is regarded as an excellent suburban station, where the "A B C" system can be seen at work by those interested in the drainage of towns; and the fact that the shares of the company have risen very perceptibly since the signing of the Acton contract would seem to show that this circumstance has been duly appreciated in financial quarters. Acton is spending between 60,000*l.* and 70,000*l.* on its scheme; Hounslow, since it gained its freedom from connexion with the Lower Thames Valley Sewerage Board, has been busily occupied with a separate scheme, which cannot fail to cost a very large sum, considering the large area to be drained. So that within a year or two a pretty considerable sum will have been sunk in separate district drainage schemes, and if it be impracticable to utilise the sewers, or a material portion, at any rate, of this vast drainage machinery in the forthcoming combined scheme,—which some persons anticipate will be in operation within the next eight or ten years,—this expenditure must ever remain without its full return. Still, the superior advantages of a well-considered combined scheme may outweigh this consideration.

THE last instalment of the Transactions of the Royal Institute of British Architects is a very attractive and well-illustrated one. It contains Mr. A. Graham's paper on Roman Remains in North Africa, accompanied by lithographs, by the Sprague process, of some of the finest remains of triumphal arches, and proposed restorations of them, as well as drawings of mosaics, &c., from the same part of the world. Mr. Baggallay's paper on the flint-work of the Suffolk churches is both of practical and artistic value, and is also very fully illustrated.

MR. WILLERT BEALE has sent round a circular with reference to the position and prospects of the Crystal Palace, proposing a means of resuscitation for that, we fear, by no means flourishing institution. Frankly admitting that the mere current expenses require an average of receipts too formidable to be covered, in years to come, "by occasional fêtes and uncertain monster gatherings," and that the original purposes of the Palace have been overlooked in the engagement of tight-rope dancers and athletes (which form of entertainment has also, it would seem, been unremunerative), Mr. Beale suggests the effort "to court Dame Fortune's golden smile" by reverting to the Prince Consort's original idea of the educational objects of the Palace, and making it a Fine Art College. There is something in the way it is put, as the following sentences from the circular will show:—

"A charter should be obtained authorising the College to confer Degrees in Painting, Sculpture, Architecture, Engineering, Music, Literature, Languages, and the Drama. Houses should be built in the Crystal Palace grounds, suitable to the requirements of each of the branches of study referred to, as well as for residences of professors and pupils. The Crystal Palace should be closed to the general public during Term time, when season-ticket holders, professors, and students only should have access to it. During the holidays the public should be admitted as at present.

The Fine Art College would take rank with Oxford and Cambridge, and would, in fact, afford facilities to the art-student such as, with all our modern institutions, do not yet exist elsewhere. The curriculum of study would be pursued in a healthy climate and locality, under the guidance of professors who would jointly conduct the course of education necessary to qualify an artist.

Hardly any change in the arrangements of the Palace is involved in the plan. The Band would remain, and its members might become professors of their respective instruments, at the Fine Art College.

The Art and Architectural models, brought together at such vast expense, would be made to serve their most legitimate purpose."

We fear the atmosphere of gymnastics and fireworks which has of late years pervaded the Palace has created a sort of prejudice in the minds of many against any such serious use of the place; but we should be very glad to see any such scheme for continuing the career of the Crystal Palace under happier auspices carried out, and we do not see that there is any insuperable objection to the idea.

THE Railway Congress at Brussels last week seems to have touched upon some very important subjects without promoting progress in regard to them in any way. Thus the question of automatic brakes was shelved with the conclusion that they prevent certain classes of accidents, but are very costly, and that these classes of accidents are "rare": in other words, we suppose, the compensation to injured persons costs less than the brakes. That is a true and typical "railway view" of the question. In regard to communication between passengers and guards, the Congress only arrived at a recommendation that "it was desirable to establish an efficient system of communication between passengers and guards." Plenty of people could have told them that without going to Brussels to make the discovery.

IN the current number of the Journal of Proceedings of the Institute of Architects is printed a memorial to the Council of the Institute from the "Stone-carvers' Trade Association," stating that in the opinion of the memorialists the inferiority in the quality of carved work at the present time "is directly traceable to the prevailing system of including the carving in the builder's estimate." The builder sub-contracts as cheaply as possible, and secures to himself, for inferior carving, a large percentage of the money set apart for carving. The memorialists therefore pray the architects to keep contracts for carving in their own hands, and deal directly with practical carvers. We are entirely in sympathy with the memorial. We do not go so far as to say that the bad quality of modern carving is directly and entirely due to the "middleman" system; but we are quite certain that it is not the system to foster art or secure the best results.

THE ANNUAL EXCURSION OF THE ARCHITECTURAL ASSOCIATION.*

On the way back from Canons Ashby, a short stay was made at Moreton Pinkney, a pleasant village with many substantial houses built in alternate bands of light and dark stone, and having mullioned windows, bold copings with good simple kneelers, and the invariable Northamptonshire chimney. Thence by way of Thorpe Mandeville (of which the church tower was illustrated in last week's *Builder*) the party went to Middleton Cheney to see the fine church. It is chiefly of the Decorated period, but the tower, with its beautiful west door, and the spire, are Perpendicular. The south porch is somewhat remarkable, having a very steep stone roof, to the support of which an arched stone rib or principal in the middle of the porch helps. The space between the rib and the roof is filled with Flamboyant tracery, and presents one of those characteristic features of Mediæval work which may either be considered as evidences of the thoroughness with which the work was done,—for the position of the tracery prevents its being properly seen,—or of a wicked and wasteful tendency to put carefully-designed and executed work in places where it could never hope to be fitly viewed. At the door of Middleton Cheney Church, but the door of an earlier structure than the present, one John de Curci lawfully received to wife Alfrice, daughter of Godred, king of the Isle of Man, and there endowed her with much land, of which "all he had in Middleton" was a very small part. The gift was as complete as words could make it. She was to "hold and possess all the said lands in frank dower freely and quietly, honourably, wholly, and fully, in monasteries, chapels, and tithes, in wood and plain, in meadows and pastures, in waters and mills, in ponds and rivers, in ways and paths, in salt and fresh waters, and in mosses and moors, in fisheries and fishes, and in all liberties, with soc and sac and thol and theam" (what could a man do more than that?), "and 'infangtheof in furcis and fossis and ferro and duello,' or the privilege of trying felons taken within her fee, and of having gallows for the purpose of hanging male, and pits for drowning female, criminals; and the power of subjecting the accused to the fiery ordeals of burning irons or heated ploughshares, and to the ordeal of duel or single combat." And a very pretty endowment for a blushing bride, too. The bridegroom still further distinguished himself in after years, and the paragraphs of Baker's Northamptonshire, whence this information comes, read like a condensed edition of "Ivanhoe." The respective titles of King John of England and Philip Augustus of France to the Duchy of Normandy were to be tried by the duellum or single combat. The French king was provided with a champion, but the miserable John had none. At length it was suggested that John de Curci would be the fittest man, notwithstanding that he was then in disgrace with the king, as most good men were. He was accordingly summoned, but refused compliance till an appeal was made to his patriotism, when he replied that for the honour of his country, though not for the king, he would hazard his life. "At the day appointed," says Baker, "the two combatants appeared in the presence of the kings of England, France, and Scotland, but the French champion, alarmed at the formidable aspect of his opponent and the size of his sword, set spurs to his horse and fled when the trumpet sounded the last charge; and victory was consequently adjudged to the earl. The French king being desirous of a proof of the prodigious strength which was ascribed to him, the earl directed a helmet full faced with mail to be set upon a coat of mail and placed on a block of wood, which, with one blow, he smote asunder, and struck his sword so deep into the wood that none present could extricate it with both hands, though at the first effort he instantly disengaged it with one hand" (perhaps the others had loosened it). "King John, in the warmth of his gratitude to the earl, not only restored him to his titles and estates, but offering to confer on him any other marks of distinction in his power, the earl desired that he and the heirs male of his family might have the privilege, after their first obeisance, to be covered in the royal presence of him and his successors, kings of England, which privilege was granted and has been lineally transmitted to his descendants, barons of Kinsale, to the present time." So much for John de Curci, the mightiest man of whom Middleton can boast, though it numbers among its worthies one not less celebrated in other ways,—William de Edyngdon, who was priest here from 1327 to 1345, and afterwards Bishop of Winchester. This William was a great builder, as witness the beautiful church at his birthplace, Edington, in Wiltshire, and, no doubt, much of Middleton Church is his work, unless he employed his more famous assistant and successor, William of Wykeham,—which is hardly likely. William of Edington is the originator of the saying, afterwards used by Bishop Fox, that Canterbury might have the higher rack, but Winchester had the deeper manger.

Since leaving Cropredy the route had lain entirely in Northamptonshire, and it was still in that county that the next day's excursion began, by a visit to King's Sutton. The three steeples of King's Sutton, Adderbury, and Bloxham are locally celebrated for embodying the three qualities of length, strength, and beauty, the last quality being assigned to King's Sutton. Tastes notoriously differ, and are not the proper subject for dispute, but surely it must be an untravelled native who holds up King's Sutton spire as a type of beauty. It is true that the two pinnacles at each corner of the tower where the spire springs are somewhat unusual features, and the flying buttresses which connect them with the main structure are striking, but the outer pinnacles which receive the thrust of the buttresses look as though they would willingly have done with the job and fall into the quiet churchyard, and the bristling appearance resulting from so many pinnacles close together is not altogether pleasing. The interior of the church is no more interesting than that of most village churches (they are all of interest, especially to the Gothic enthusiast); the spire was too complicated a subject to sketch in the showery weather, so the excursionists settled like bees on the picturesque manor-house close by. Some score attacked the outside from various points of view, the others might be found obstructing the staircase (under the pretext of measuring it), or taking dimensions of a bay, or mounting to the attics to look at a terrible picture of St. Sebastian pierced with arrows in very vital parts of his frame,—all to the amusement of the excellent inmates, who were quite pleased at this tremendous invasion of their quiet home.

Adderbury was the next place on the list, and here was found a very fine church indeed, but "in the throes of restoration," as one of the party remarked. Mr. Sedding introduced the church to the notice of his companions in a piquant paper from which the following are extracts:—

"Such bold, strong, vigorous art as we get here must have its value for all time: and one may say that this fine church would of itself go far to justify the study of Gothic architecture in the present day. Prominence is assured to any building which represents William of Wykeham, as this does in its chancel. Apart from this fact, however, you will agree with me that you could not make a list of the typical churches of England, and not include this one of Adderbury.

The church has a chancel 40 ft. by 20 ft.; transepts, 71 ft. across; nave, 60 ft. wide, including the aisles, and 71 ft. long. It has also a western tower and spire, and north and south porches.

From this description you might infer that Adderbury Church was quite ordinary and commonplace, but it is not so, either in regard to plan or detail. Nature abhors symmetry, and so did the Goths who laid out these walls all askew, and ceased not to play pranks with their parts for a couple of hundred years afterwards, until Adderbury Church is as puzzling to the know-all archæologist as the araucaria is to the monkey! The chancel does not 'run' with the nave, and is wider at one end than the other. The tower is several feet 'out of centre' with the nave.* The westernmost bay of each of the nave arcades is,—for no apparent reason,—very much smaller than the three eastern bays. If you walked across the church from one porch to the other you would bump against two piers. Then the aisles are wider than the nave; the easternmost bays of the arcade are as wide as the transepts, and there are coupled arches where the aisles intersect with the transepts. There are two sorts of clearstory windows, and the two easternmost bays look into the transepts. . . . .

Why were the transept clearstories added? For the reason that, as power of design developed, there grew a passion for lofty walls and fine interior effects. Oddly enough, the Norman builders and the Perpendicular builders are of one mind in this particular. The thirteenth and fourteenth century builders think much of the high pitch of their roofs. They do not aim at the high walls, but rather at the glamour of light and shade obtained by sticking timbers of curious and interesting shapes across a void space. The twelfth and fifteenth century builders, on the contrary, do not care a dump for high-pitched roofs (a flat panelled ceiling preferred), but they concentrate their skill upon the wall-spaces; that is, upon the architecture proper of the structure, and aim at nobility there. Alas! that the noble architectural proportions of some thousands of our parish churches should have been ruthlessly destroyed in order to gratify the insane nineteenth-century craze for steep roofs *versus* high walls. The cry of a 'return to the original pitch' has served good people with a justification for working untold mischief in buildings whose qualities of design they had neither the eyes to see, the sense to comprehend, nor the taste to admire. . . . .

From the rapid sketch I have given of this church, it will be seen that its architecture covers a wide and varied range of design. Where the work is everywhere so good, one does not like to praise one set of workmen at the expense of another, for the dead have feelings†; yet I must say that for masculine vigour and refined, unaffected power, the fourteenth century design, at this and at the sister church at Bloxham, is beyond all praise. We are reminded of Bloxham by much that we see here: there is the same treatment of coupled arches to the transepts, the same aisle parapets of two stages, with a deep cove below containing rich carvings; only that I cannot help thinking that Bloxham is 'prentice work compared with Adderbury, beautiful though it be. The drawback to our full enjoyment of Adderbury lies in the fact that the tracery of the nave and chancel windows is only conjectural. A print done about 1800, which I have seen, shows the church as it then existed, and the windows referred to are void of tracery. But we can spare the window tracery while we have the sculpture to the eaves-courses and the transept capitals; for I doubt whether through all the range of English carving there is anything better in its way than this. The capital to the north transept has busts of women with grave, beautiful faces, evidently studies from life. That to the south transept is re-chiselled and spoiled; it has men in armour, with their arms linked. Fancy what people would say if we introduced the figures of our modern soldiers in the decoration of a modern church! The north aisle eaves course is a perfect sample of the kind of sculpture that all generations of Adderbury folk can enjoy so long as they continue to be produced upon old English lines. How this work escaped the Puritan's holy hammer passes my understanding, except it be that the pious man never lifted his yellow eyes high enough to see it. Such carving as this shows us that the old carver could both jest and pray; he knew how to mix things human and divine as they *ought* to be mixed upon the walls of that building which is the trysting-place of God and man; he could express his faith and tell of man's relation to the court and company of heaven, and yet give his art local flavour and a spice of humour, by inserting current village jests and contemporary portraiture. Thus we get the coronation of the Virgin, with attendant angels and saints, and busts of King David and other musically-minded people playing on harps, dulcimers, and all kinds of instruments. A little farther on is delineated a sporting event that probably happened at the time the work was progressing, which has its comic side. Here is the Mediæval Briggs as an archer making a bad shot, for his arrow has wounded his hound (now making moan), has scored a gash in the hide of a harmless cow, and has, finally, lodged in the leg of a rustic. Then come the portraits of the village band with bagpipes and other instruments, a mermaid, owls, several authentic likenesses of village worthies, &c. . . . .

* Continued from p. 238.

* All which is simply saying that the building was most carelessly and stupidly set out. A modern builder would be called an ignorant bungler who did his work so; why is it to be admired in a mediæval building?

† Has Mr. Sedding satisfied himself on this head by personal investigation?

In the opening remarks of this prolix dissertation I said that this church would go far to justify the modern study of Gothic architecture. I conclude by calling attention to the magnificent array of seventeenth-century and eighteenth-century tombstones now lining one of the churchyard walls. Their bold carving shows that the fine traditions of the Mediæval school of sculpture, which existed in these parts, had not up to that time entirely died out, as they are all of the 'Queen Anne' period by anticipation or realisation. The Architectural Association will do them justice; and I am persuaded that, if studied in a proper attitude, the forms of these memorials of the dead will open out new prospects to contemporary design."

Besides the features thus alluded to, there is in the vestry a wooden tablet, on which is depicted, as it says, "the representatiō of Thomas More, gēt: who deceased the 2 of Jan. 1586, and of Marie his wife." Both of them are drawn kneeling on either side of a tomb, on which is inscribed,—

"So far is ought from lasting aye,
That tombes shall have their dying day:"

a very true remark in this case, as the tablet is the only record remaining of the Mores. The execution is extremely good,—not at all in the usual style of the village signboard artist; and, in addition to the foregoing legends are various sententious phrases in Latin and English, such as, "Quasi moriturus vive," "Vive pius, moriere pius."

Deddington was next reached, where there is another good church, and several interesting houses, notably one near the church, once the parsonage-house. The most remarkable feature of the church is the roof of the north porch, which is in shape a flat dome, of Gothic tracery, with traceried pendentives. The tower fell in the year 1635, and carried portions of the church with it. For some years nothing could be done towards the rebuilding: so, in 1643, Charles I. bethought him of the bells, which were lying "unserviceable." When cannon was wanted it was a pity that so much good metal should be wasted: accordingly he addressed an order, dated at Oxford, January 21st, 1643, to the parson, churchwardens, and others, requiring them to send the bells "to our magazine here in New College," and guardedly promising to "restore the same in materials or moneys to your church when you shall have occasion to use the same." The occasion arose some time before 1649, the date of one of the new bells; but how far the king helped is not on record. The old materials were largely re-used, but the mouldings are, many of them, new and thoroughly Classic in profile. The rectorial house, already mentioned, which stands to the north of the church, is a picturesque building of the seventeenth century, with a balustrade round the summit of a kind of central tower. Inside are several well-proportioned rooms, and a very good staircase, with much unusual detail. A very acceptable cup of tea at the vicarage brought the visit to a pleasant close, and the party returned to head-quarters by way of the small and rather puzzling church of Barford St. Michael.

Thursday began with a visit to another fine house,—Wroxton Abbey,—once a priory of Augustinian monks, of whose buildings some fragments are built into the new house, which was erected in 1618. The property passed, about the year 1538, into the hands of Sir Thomas Pope, the founder of Trinity College, Oxford, and on it were certain remains of the old buildings, duly named in an inventory taken at the time, together with the "condyte," "with all the lede thereto belonging," certain "brasse potts in the kichyn, to sythe mete in," and many leaden vessels. The most noticeable feature inside is a magnificent collection of family portraits, by all the best masters since Holbein. Some of them are, indeed, exquisite. The colour, the composition, the execution are alike perfect. They are, first of all, portraits, but have enough accessories to be of interest as pictures, without suffering the individual depicted to become a mere incident in a landscape. There is also a great deal of carved woodwork, too, but it was imported mostly from Flanders, and is, therefore, interesting in detail, and not as a specimen of Jacobean panelling. The front entrance is a fine example of Renaissance work, with quite as much ornament as is good for one time; unfortunately, a window has been introduced over the front door, and mutilated the upper part of the design. The grounds, with their enormous lawns, tree-clad undulations, lakes, and formal gardens, are alone worth a long journey to see. The church is chiefly noteworthy for a very beautiful Jacobean monument to Sir Wm. Pope, first Earl of Downe, and his wife. The details are refined, and the whole monument the work of as excellent an artist as he who designed the Cordell monument at Long Melford, visited on last year's excursion.

From Wroxton a drive of a few miles led to Alkerton, where the pretty little church looks across the deep valley, to its sister of Shenington. Most of the structure is quite early, and the chancel arch is a fine specimen of the deeply-recessed mouldings of early work, but much work was done here, as in all the churches round, in the Decorated period. The plan is rather peculiar, the tower being over the chancel, or rather between the chancel and the nave. There is a south aisle, but no north aisle, and as there is a clearstory the north side presents externally a two-storied building of much interest. The parapet of the west end is adorned with excellently-carved quatrefoil panels, which formerly returned along the side parapets, but which have now almost wholly disappeared. Here for some years Thomas Lydiat was parson. He was a native of the village, died here in 1646, and was buried here too. He was a mathematician and chronologer of the same mark, and is mentioned by Johnson in his "Vanity of Human Wishes."

By way of Edge Hill, where, with the help of a small diagram and the clear description of the President, the battle between Charles and Essex was well realised, the party went to Warmington, obtaining on the journey vast glimpses over the plain to Warwick and far beyond. At Warmington they found a charming little church, perched up on a high bank, and approached by a perfectly straight flight of nearly forty steps. The church is mainly of the Decorated period, but the nave arcade goes back to the first hundred years after the Conquest, and has curious high bases and short piers. But excellent as is the church, the most interesting portion is the two-story building attached to it on the north side, which was formerly a priest's residence. The ground-floor has a fire-place and two windows, the sill of the eastern of which is corbelled out inside to form an altar, while in the same wall is a small piscina; the room, therefore, must have been both tiring-room and chapel. The upper room, approached by a steep winding staircase, which forms an agreeable feature outside, has also a fire-place, and in one corner a latrine formed in the thickness of the wall at the north-west corner behind the angle buttress. The ventilation is by means of two small slits in the wall, not more than 20 in. in area, and wholly contrary to the regulations which guide the modern surveyor. It is to be remarked that the angle buttress referred to finishes at the top with a pinnacle, in the faces of which are pierced trefoils, indicating that there is a shaft within. This shaft may either have ventilated the latrine or served as a chimney, probably the latter, as the present chimney is modern, and an account of the church by the late Mr. Parker speaks of the smoke then (1840) escaping through "a sort of eyelet-hole."

The last place visited on this day was Hanwell, where are a church and the remains of the castle. The church has one or two unusual features; a good Decorated reredos at the end of the north aisle, consisting of a series of small canopied niches; and a fireplace at the south-west corner of the south aisle, with its chimney complete. The caps to the nave arcade contain carved figures playing on musical instruments, a device of considerable ethical interest, but surely a failure so far as regards grace of outline. Of the castle, there is not much left,—only a brick tower, with octagonal turrets having stone quoins. This seems to have been originally the end of one wing of what Leland calls "the pleasant and gallant house of Hanwell," built by Anthony Cope, cofferer to Henry VII. There is no detail of any consequence, and if there had been, permission was refused by the inmate to inspect it. The colour and general outline are pleasant, and the red mass, seen in conjunction with two large, lichen-covered stone gate piers, once the chief entrance to the lordly precincts, forms a pleasing feature.

On the last day of the out-of-town excursions Broughton Castle and Bloxham Church were the main points of interest, for Wigginton and South Newington churches were not held worthy of more than a quarter of an hour's visit. Bloxham Church is well known as a fine example of ecclesiastical architecture: it is of great size, and possesses many beautiful features, but a very complete restoration has somewhat impaired its interest. Much of the structure is said to have been built by Cardinal Wolsey, and its style no doubt would tend to justify the supposition. The beautiful tower and spire are certainly better as a mass than as an example of detail, for the manner in which the angles of the octagon come down on to the belfry windows is far from happy, and distinctly below the customary high level of Mediæval work. The label of the western door is ornamented with sculptures representing the Last Judgment, but of these it may be said, as of the numerous carvings in the hollow of the cornices of many of the churches hereabouts, that they would be more pleasing if bound more strictly with architectural bands. These are but minor matters, however, and Bloxham steeple must always remain one of those works which seem to lift man out of himself, and speak to him in noble and purer accents than those which usually fall on his ear in this workaday world.

Broughton Castle, which formed the *pièce de résistance* of the day, is one of the text-book examples of domestic architecture. Its chapel, its well-wrought corridors, its staircases, and its chambers have pointed many an architectural moral and adorned many an historical tale. The De Broughtons built the oldest parts in the fourteenth century; to them must be ascribed the interesting domestic chapel, the vaulted corridors with their carved capitals and bosses, the hall, and a certain circular stone staircase, for a long time the only means of access from one floor to another. After the De Broughtons follow the Wykehams, blood relations to the great William, from whom, indeed, they inherited the place. To their time belong the gatehouse, the stables, and the battlemented wall, now a ruin, ivy-clad, and the protector of captive fowl. To the Wykehams succeeded the Fienneses, Lords Saye and Sele, who still reside there. Their mark is the most conspicuous; for not only did they enlarge the house they found, but by throwing out large bays to the hall they gave the whole place an Elizabethan character which false time has stamped over much of the earlier work too. From every side the mansion looks well. The moat still surrounds it, washing its eastern wall, and on all other sides leaving a fair level expanse of garden and grass; ancient trees dip their sturdy arms and fingers into its placid waters and themselves bear witness to the centuries which must have passed since the waters in which they are peacefully mirrored flashed back the glitter of arms and the blaze of banners. The gateway remains, robbed of all its terrors, but still the only means of access to the island, and when its sturdy proportions are grouped with the long, dark, gabled, and battlemented mass of the house and the pointed spire of the church with the broad quiet moat spreading right across the foreground, it forms a picture from which the sketchers found it hard to tear themselves. Inside, the house abounds in relics of the Roundheads, for the Lord Saye and Sele of that time was a "root-and-branch" man, and one of the chief props of the Parliamentary party. It was here and at Fawsley that, at the beginning of the troubles, the earnest meetings took place between Hampden, Pym, Eliot, and Nathaniel Fiennes. The room in which they met is still pointed out, and the adjacent leads upon which they took the air after a heated discussion. On Friday, the venerable Lord Saye and Sele himself pointed out to a few of the party the advantages of the quarters chosen by the councillors, and from the historic platform where the opponents of Charles's tyranny paced, he called out to an astonished sketcher below, "No taxation without Parliament." The commodious attics in the roof are still called the "barracks" from having been for some time the quarters of Parliamentary troops, and the upper part of the ancient circular staircase, already mentioned, has been dubbed "Mount Rascal," from having been used by the soldiers. Not a complimentary piece of humour, it is true, but then Lord Saye and Sele subsequently changed his opinions, and became Lord Privy Seal in the first cabinet of Charles II. His recantation is said to have been marked by an architectural feature in the dining-room, an ornamental wooden porch projecting into the room at one corner, and bearing the regretful motto, "Quod olim fuit meminisse minime juvat." Every one says the porch was

placed there after the Restoration, but if so it must have been brought from somewhere else, for it is distinctly Elizabethan in character and accords completely with the date of that wing of the house, which is 1599. The inscription stating that "the memory of what used to be gives little pleasure," might equally well apply to some architectural feature which the porch replaced, as to the change in its owner's opinions. However that point may be, there can be no doubt that the porch itself is a very excellent piece of work, as is also the ceiling (dated 1599) of the room above, which breaks down into innumerable pendants. Another interesting feature is the bay window of the gallery, thrown out in 1554, as the date on the chimney above states. It has many lights in width, and two in height; the lower mullions are treated outside like half Ionic columns, the upper as Corinthian; the angles being in the form of pilasters.

Just outside the gate-house is the church, a pretty Decorated building, with two of the best windows seen during the expedition,—indeed, there can be few of its size so fine as the east window of the south aisle, with its delicately-cusped inner arch. The nave arcade, too, is good, but the stone chancel-screen, though interesting, from its rarity, is dull. There are several fine mouuments to the various owners of the castle, one of which, in the chancel, must have been a magnificent affair before it was mutilated. Shakspeare says,—

"By Time's fell hand defaced,
The rich proud cost of out-worn buried age."

But the destruction here was that of "mortal rage," and it is an interesting question whether if Shakspeare had gone to Broughton, he would have seen the tomb whole or not, for much of the mischief attributed to the unfortunate Cromwell was perpetrated a century before his time.

Few places have been left with so much regret as Broughton. It suits all tastes,—the early man, the "late and flat" man, the worker in water-colours, those of the pencil and him of the pen; and it suits the lounger, who prefers to drink in with all his senses the atmosphere of the place, to committing small portions of it to paper; and all must agree in rejoicing that such a building is in the hands of one so loving to itself and so courteous to its visitors, as its present owner.

Of Banbury itself not much need be said. Of all the "original" cake-shops the most picturesque is in the main street, and its projecting gables, pargetted walls, and bold circular bays make a most effective appearance. In the Reindeer Inn is a particularly fine room, with an excellent plaster ceiling, and dark oak panelling extending to the floor. The shape and arrangement of the room are pleasant, and the whole effect is heightened by coming as a surprise. The church is a comparatively modern structure, having replaced the old one in 1793. Its circular tower "in the Italian style" is far from displeasing, and the decoration of the interior is reported by competent authorities to be above the average. Much admiration is lavished on the departed building, and from such views as remain, it seems to have been a fine church, as good certainly as Adderbury, but local enthusiasm exceeds its due limits when it compares it for magnificence with a cathedral. Other antiquities, beyond several old houses, there are none; the celebrated cross is new, which may account for the absence of any fine lady on a white horse,—or coloured either, for the matter of that. But the town certainly no longer deserves the epithet of "dirty" conferred on it by another rhyme, and the excursionists have never had pleasanter head-quarters from which to make their delightful rounds.

"The Cabinet-Makers' Exchange."—Under this title, Mr. J. Williams Benn has opened, at No. 42, City-road, near Finsbury-square, what is intended to be a permanent exhibition of furnishing and decorative novelties and materials. The ground-floor is mainly occupied by a light, spacious, and cheerful reading and writing room, the wall-coverings here being by Messrs. William Woollams & Co. The basement floor and the three stories above the ground-floor are devoted to exhibition purposes, and the space has already been for the most part taken up. The Exchange is free to any London or provincial furnishers or shippers, also to architects, builders, and decorators.

THE BRIGHTON CONGRESS OF THE BRITISH ARCHÆOLOGICAL ASSOCIATION.

The forty-second Congress of the British Archæological Association commenced on Monday last at Brighton.

The annual meetings having been held at rather a long distance from the metropolis in recent years, it was determined to try the experiment of a meeting nearer home, so to speak, and an invitation from the Mayor and Corporation having been received, the meeting at Brighton has been the result, his Grace the Duke of Norfolk, E.M., having kindly accepted the office of President,—this being the second time of his rendering service in this manner to the Association.

At two o'clock punctually, a large number of ladies and gentlemen assembled at the Pavilion, when the Mayor of Brighton, on behalf of himself and his colleagues, bade the Association welcome, and called upon the Town Clerk to read the illuminated address prepared for the occasion. The members were reminded that this was the first occasion on which any antiquarian society had made Brighton its head-quarters for a Congress.

In the absence of the Duke of Norfolk, who was unavoidably prevented from being present, Sir James A. Picton, F.S.A., of Liverpool, was called upon to deliver the inaugural address, from which we make the following extracts:—

The common subject which binds us together as an association is the study of archæology. On a recent occasion, when a number of our members were gathered in a delightful tour of inspection of some of the antiquities of France, one of the visitors, hearing so often the phrase used, inquired very pertinently,—"What is archæology?" The reply to this question brings under review the whole scope of our inquiries and discussions. In brief, archæology may be defined as that study which connects the past with the present by its visible monuments. It is distinguished from written history, which is the record of human actions and motives. Ancient architecture has been defined as history in brick and stone, but this is only one department of archæology, which embraces in addition works of art of every description on which the human mind and hands have been employed. To understand the present, and to give a probable insight into the future, it is necessary to study the past, where the germs have been formed which may lie dormant in the present, to be developed as time rolls on. The human mind is the same under all circumstances, but presents itself in its results in an endless variety of aspects. The province of archæology is to discover, arrange, and classify these phenomena, and connect them with the written records of ages gone by. Beyond these records, where they fail us entirely, the Cimmerean darkness in which we are left is illuminated by the researches of the archæologist, who takes up the relics of the long-buried past, and by the inductive process of arrangement, classification, and comparison, presents us with inferences as to the condition and progress of humanity in the prehistoric times, not less certain and in many respects more trustworthy, than the written records of history. We have in our country a rich mine of antiquarian wealth to explore. Ws cannot pretend to vie with the splendours of ancient Egyptian architecture, nor the colossal grandeur of the remains of Babylon, Nineveh, and Persepolis, nor the perfection of Grecian art in the time of Pericles and Pheidias; but as regards the elucidation of history, and the transition from the old to the new, the series of visible objects within our reach possess an interest for us which far transcends any which can be derived from foreign sources. They are our own; they have descended to us by inheritance; we can trace them backward step by step into the night of ages, and connect them by an unbroken chain with what is passing before our eyes. Notwithstanding the attention which has been paid to the subject, the untold number of volumes which have been written, and the ever-increasing illustrations which have been scattered broadcast, there is still much virgin soil to turn over. In respect of those remains which have been illustrated and recorded, the interest of the archæologist is enhanced by the information thus afforded, and the assistance given to his inquiries. This information is increasing year by year, and imparts additional zest and throws additional light on the connexion of topography, not only with local records, but with our national history in general. Valuable service has been rendered by the various local archæological societies of late years in illustration of their respective localities. It is the province of the two associations* which have a more general character to combine and compare the information thus obtained, and to supplement it by actual inspection. Each county of England has its own peculiarities and its own history, and Sussex yields to none for the stirring events which have taken place within its borders, and the existing monuments by which their memory is perpetuated. The prehistoric remains are not so numerous as those in Wiltshire, nor as those in Pembrokeshire, which we visited last year. There are, however, a number of earthworks well worth notice, such as Cisbury, the Devil's Dyke, Caburn, Hollingbury, and others. Tumuli or barrows are met with, scattered over the Downs. Of the original inhabitants we know nothing. Whoever they were, they were dispossessed by the invading Cymri, who have left traces behind them in the names of the rivers Rother, Asten, Ouse, Adur, Arun, and others. The numerous Roman remains scattered over the country, in at least sixteen different localities, present strong evidence of the flourishing and prosperous condition of the county under the Roman dominion. The splendid villa at Bignor, unearthed in 1811, could only have come into existence under circumstances of peace and refinement. Having narrated the principal events connected with the descent on Sussex in the year 477, by the Saxons under Ælle, the son of Hengist, and referred to the nomenclature of the county, which he described as intensely Anglo-Saxon, Sir James Picton went on to refer to the Norman Conquest, which took place within the county of Sussex. Bosham was the residence of Harold, from which he took his voyage to Normandy, which was attended with such direful results. William the Norman landed at Pevensey. Sir James continued,—The course of his march to Hastings, and thence along the ridge to the fatal field of Senlac, can be traced with the utmost minuteness. Standing on the low hill which overlooks the downs, we can realise in the mind's eye the events of the memorable 15th of October, 1066, the most momentous battle ever fought on English ground. We can see the trench and stockade thrown up by English Harold, behind which, in the centre, clustered the body-guard of the king, men in full armour, wielding huge battle-axes, grouped round the Golden Dragon of Wessex and the standard of the king. Duke William's Norman knighthood was arrayed on the opposite side. From this point English history takes a fresh departure,—

"Th' old order changeth, giving place to new."

Out of apparent disaster springs new life. The Saxon element absorbed the Norman, but drew from it an energy, a vigour, a power, which has been the dominant influence in its progress and success. The feudal system was now established in all its rigour, and England became for a time a vast camp. The county of Sussex was divided into sixteen fiefs, held in demesne by tenants *in capite*, containing in different proportions 387 manors. These were distributed amongst the Norman adventurers, the Saxon thanes being ousted or reduced to servitude. Four castles of the first class,—Arundel, Lewes, Pevensey, and Hastings,—were erected by the Norman barons to overawe the country, and to protect their acquisitions. Some of these we shall have the opportunity of inspecting. Several fortified manor-houses were erected during the Middle Ages by the sub-feudatories; several by royal licence, as that of Camber, in the reign of Henry VIII., Bodiam, in 1386, and Hurstmonceaux, during the reign of Henry VI. Whilst on the subject of castles, I may mention that there are a number of interesting earthwork encampments at Hollingbury, Woolstonbury, Burlough, and the Devil's Dyke, which have probably been occupied successively by the Britons, the Romans, and the Saxons.—Having related the circumstances which led to the battle of Lewes, between Henry III. and the barons, which had a most momentous influence on the history of England, inasmuch as it led to the calling of a Parliament in which representatives from the boroughs appeared for the

* The Royal Archæological Institute (of whose Derby meeting detailed accounts have been published in the three last numbers of the *Builder*) and the British Archæological Association.

first time, Sir James Picton turned to the churches of the county, of which he spoke in the following terms:—Much cannot be said in praise of the church architecture of Sussex. The buildings are for the most part small and plain in their architecture. The reason for this is not far to seek. With one exception, to which I shall shortly refer, the country has been destitute of manufactures. It was the early manufacturing industry of the eastern counties which supplied the funds for the erection of the magnificent structures which the Middle Ages have bequeathed to us. The population of Sussex has always been mainly agricultural and pastoral. The church was, therefore, destitute of that material support which the richer counties were able to afford. The first place must, of course, be given to Chichester Cathedral. This, though not on the largest scale of its sister structures, and rather unfavourably situated, is very interesting, and contains a variety of styles from the twelfth to the fifteenth centuries. Battle Abbey, from its connexion with our national history, is well worthy of a visit; its remains will come under our review. The church at Arundel, with its associated buildings, will afford ample scope for a pleasant day's excursion. There existed abbeys, priories, or collegiate churches, at Lewes, Hastings, Bayham, Robertsbridge, and Durfold, fragments of which still remain. The churches of Steyning and Sompting are well known from their specimens of early architecture. New and Old Shoreham, Lewes, Bosham, Bishopstone, Alfriston, Broadwater, offer interesting examples, some of which we shall doubtless visit. The modern restorer does not appear to have been quite so energetic here as in some of the other counties, which to us, as archæologists, is cause for congratulation. Besides the churches and castles there are many interesting reminiscences of antiquity scattered about the country. The ancient town of Lewes, with its noble castle and its quaint street architecture, will come under our notice. Steyning has its Roman and Mediæval associations and its fine old Norman church. Old and New Shoreham present features of antiquity worthy of inspection in addition to the churches. In fact, a ramble amongst the quaint old villages of Sussex would give a vivid idea of England in the olden time. The tide of commerce and manufactures has for so many ages set in a northerly direction, that we are apt to forget the distinguished part played by the southern counties in our early history. International commerce in its first feeble development was here cherished and protected, and manufactures in one important direction here had their seat. I allude more particularly to the iron smelting and casting for which Sussex was long renowned. Ironstone of excellent quality is found in various parts of the county, and was very early made use of. Even before the advent of the Romans, the forest of Dean in the west, and the forest of Anderida, in Sussex, in the east, were the two principal sources from which the metal was derived, and all through the Mediæval ages the manufacture was continued. After the discovery of the art of smelting and casting iron in the sixteenth century, the manufacture in Sussex received a great impulse from the abundance of wood for fuel, and from that time down to the middle of the last century it continued to flourish. One of the largest furnaces was at Lamberhurst, on the borders of Kent, where the noble balustrade surrounding St. Paul's Cathedral was cast, at a cost of about 11,000*l*. It is stated by the historian Holinshed that the first cast-iron ordnance was manufactured at Buxted, in this county. Two specialties in the iron trade belonged to Sussex, the manufacture of chimney backs and cast-iron plates for gravestones. At the time when wood constituted the fuel, the backs of fireplaces were frequently ornamented with neat designs. Specimens, both of the chimney-backs and of the monuments, are occasionally met with. These articles were exported from Rye. The iron manufacture, of course, met with considerable discouragement on the discovery of smelting with pit coal, and the rapid progress of iron works in Staffordshire and the north, but it lingered on until the great forest was cut down and the fuel exhausted. The last furnace was at Brede, near Beckley, a few miles from Rye, which was discontinued in 1825.

Sir James was briefly thanked for his address by Lord Mount-Temple, seconded by the Ven. Archdeacon Hannah, and he expressed his thanks for the gratification he had given his audience.

A paper was then read by Mr. F. E. Sawyer, F.S.A., on "Old Brighton." In the course of his address, attention was called to the fact that the building operations carried on in the town had been so rapid that no change of the old local divisions had been attempted. The map of the modern town, therefore, showed many of the old boundaries, &c., in the wide streets of to-day. The town dates from early times, and pleasant reference was made to the contrast afforded by the ancient hill-forts around Brighton, the places of shelter of the earliest inhabitants of the district, the fishing village of very recent times, and the town as it now exists. Several points of local history were referred to, viz., the escape of Charles II. from England from the George Hotel, now pulled down, and the existence of a "Permissive Bill" in the early part of the seventeenth century.

After Mr. Roach Smith, F.S.A., had proposed a vote of thanks to Mr. Sawyer, the party proceeded to the old Church of St. Nicholas, Brighton, where the Ven. Archdeacon Hannah described at length what is known of its history, and afterwards proceeded to point out the portions of the church which are original, namely, the western tower, a plain solid fourteenth century work, and the chancel arch. The aisles and the nave piers have been rebuilt in recent years. The interest of the church centres in the good rood-screen of fifteenth-century date, and the very remarkable font. This is covered with carved figures in bold relief. On one side is a representation of the Last Supper; on another apparently a portion of the history of St. Nicholas. The intermediate spaces contain the Baptism of Our Lord and a fourth subject not well made out. The date is about the middle of the twelfth century.

Proceeding to the Brighton Museum, the party inspected the large and well-known collection of English pottery formed by Mr. Henry Willett, F.G.S., and now lent on loan. Mr. Willett proceeded to describe the articles, which are displayed in cases arranged in an unusual way, but which admirably brings out the curious points of the collection. In case A, for instance, Royalty and Loyalty being the title, articles of pottery representing our kings and queens are grouped. Case B is devoted to hero worship. Case C to politics, Napoleon, statesmen, and the like. The collection is remarkable in every way, and of large extent, filling a large gallery with about 20 cases. Good examples of the earliest of our old English pottery form part of the collection, together with many curious pieces, including some Elizabethan green glazed terra-cotta panels for decorative purposes in buildings. After Mr. Willett had been cordially thanked, the Sussex antiquities were inspected, including the beautiful amber cup found in Palmeira Square in 1865.

A special loan collection of paintings and drawings of ancient Sussex buildings was also inspected in the museum, arranged by Mr. G. de Paris, containing works by Nibbs, Scott, de Paris, Earp, and other local artists.

Tuesday was devoted to a visit to Chichester and Boxgrove, and the party, leaving Brighton by a special train at an early hour, arrived at the former ancient city in good time to spend a long day in useful investigations. Proceeding to the Museum, under the guidance of Messrs. Henry Griffith, the hon. local secretary, and G. R. Wright, F.S.A., the hon. Congress secretary, the interesting collection of local antiquities was described by Mr. C. Roach Smith, F.S.A., who pointed out the peculiar Roman pottery found in the district, as well as the lapidary inscriptions of the same age. The most important of these found in the district is now at Goodwood, but for convenience of reference in relation to the others, it was described at the Museum. Dr. Birch, F.S.A., deprecated the hypothesis which has connected the name PUDENS of this inscription with the early convert to Christianity, and agreed with Mr. Smith as to the importance of the inscription. It commemorates the erection of a temple to Minerva and Neptune by a college of smiths, probably the precursors of the trade guilds of later times, with the authority of a local king, Pudens having given the ground. After a vote of thanks to Mr. Smith had been proposed by Sir J. Picton, and cordially rendered, the party proceeded to inspect some excavations which had been made by the Association at the base of one of the projecting bastions of the old city wall on the south side. The contours of these walls have long suggested that they occupied the site of the walls of the ancient Roman city, but nothing of this early date is to be noticed above ground, except a few Roman bricks sparsely used as old material. The existence at one time of walls to the Roman city might be considered as certain, from its importance in these early times, and the analogy of other large Roman cities.

It had been resolved upon by the Association to ascertain if the ground covered any work of older date than what was visible, and the excavations were made at a bastion selected by Mr. Roach Smith, the Archdeacon of Chichester having granted leave. A discovery of the highest antiquarian interest has resulted. The Mediæval bastion is found to rest upon the base of a larger semicircular tower, having a bold chamfered plinth, the whole solidly founded upon a square base of massive blocks of squared sandstone, there being a set-off to the latter for additional strength. Mr. Gordon Hills and Mr. Roach Smith commented in turns upon this remarkable discovery; and Mr. Loftus Brock, F.S.A., who descended into the excavations, pointed out that the whole of the solid mass was built with red Roman mortar of pointed brick. It may be taken, therefore, as a determined problem that the city had a wall in Roman times, and that the present Mediæval ones are founded upon it.

Escorted by the Bishop of Chichester, the dean, the archdeacon, and several of the cathedral dignitaries, the grounds of the palace were perambulated and the ancient building inspected, the bishop pointing out in passing the colossal head of a Roman statue of white marble, probably Nero. Arriving at the cathedral, the party listened to an interesting lecture upon its origin and architecture by Mr. Gordon Hills, the cathedral architect, and an old member of the Association. Taking his stand at various spots the different peculiarities of the interesting building were pointed out. Chichester Cathedral strikes a spectator at once by the irregularity of its setting out. The lines are not straight, the angles are not right angles. The Norman work is of the highest interest, not only on account of its varying dates being well made out, but as well from the excellency of the design of each several part, and the ease with which many curious additions and alterations can be followed. The double aisles to the narrow nave give an appearance of width and size which the building does not actually possess, while some pretty effects of colour are produced by the introduction of alternations of red stone. The fine collection of paintings of the early bishops is now carefully placed against the north wall of the north transept. Mr. Hills pointed out the so-called tomb of Bishop Richard,—St. Richard, as he is so frequently called,—where the fine effigy is in reality that of Bishop Robert Stratford, the record being very precise that the shrine of St. Richard was demolished at the Reformation.

After proceeding through the cloisters, past the site of the Chapel of St. Faith, a portion of which is still visible, luncheon was partaken of at the Dolphin Hotel, and a start was made for Boxgrove, past the beautiful and well-known Market-cross in the centre of the city. At Boxgrove Mr. C. Lynam read a paper upon the remains of this beautiful monastic church. Two churches, one parochial and the other monastic, have existed under one roof, so to speak, the parish having the nave and the religious the transepts and choir, an arrangement reversed probably at the Reformation, the parish now assembling in the eastern portion, while the western has gone to decay. The work is very beautiful, and the vaulting of the whole of the nave, choir, and aisles very effective. After inspecting the few remaining ruins of the monastic buildings the party proceeded to Goodwood Park and mansion, by the invitation of the noble owner, the Duke of Richmond and Gordon. After inspecting the fine collection of portraits of the middle of the seventeenth century by Lely, Kneller, and others, the famous Pudens stone, now in a summer-house in the grounds, was inspected, and commented upon by Dr. Birch and the Bishop of Chichester.

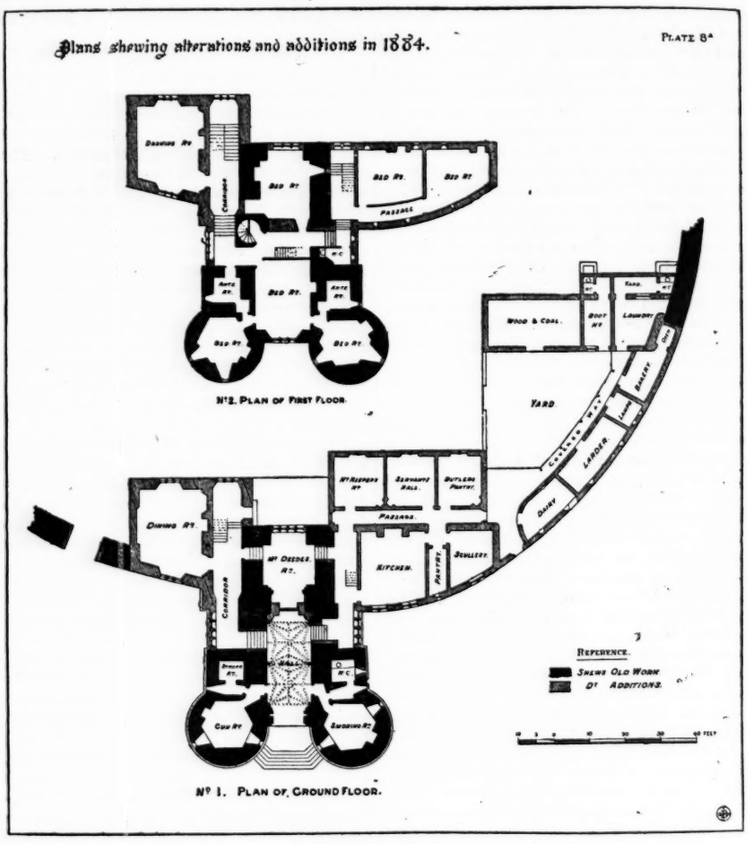
Returning to Brighton, a paper was read at the evening meeting on the results of excavations at Cissbury by Mr. E. Willett, F.S.A., and another by Mr. E. P. Loftus Brock, F.S.A., on the peculiarities of the Sussex churches.

On Wednesday, the 19th, the party, leaving Brighton again at rather an early hour, proceeded to the well-known church at Sompting, a building which possesses a Saxon tower at the west end of a cruciform Norman church. The tower has the peculiarity of having a gable on each face, above which is a pyramidal roof, the hips springing from the apices of the gables, a design similar to many of the early churches of the Rhenish provinces. The party having proceeded to the north-west angle, whence a good view of the fabric can be obtained, a short lecture was given by Mr. Loftus Brock, F.S.A., who pointed out that some portion of the church had been erected with the materials of some more ancient Roman building, many of the flat bricks of Roman date being worked in over the heads of the windows on the north side. The peculiarity of the curious projecting pilasters at the angles was pointed out, the central shaft, extending to the apex of each gable, being semicircular. These are worked in Caen stone bonded into the walls with a stone of great hardness resembling tufa. Entering the building, which was restored several years ago by Mr. Carpenter, Mr. Brock exhibited a plan of the building placed at his disposal by Mr. Herbert Carpenter. The transepts have eastern chantry chapels opening from them, those on the north side being vaulted in a very effective manner. At the east end are several aumbries, having delicately worked Saxon interlaced work fitted and cut to form their heads or lintels, these portions having been used as old material and removed probably from the old Saxon building on its being superseded by the present Norman work. At the north-west side of the nave is a separate chapel now in ruins. Mr. Gordon Hills gave some interesting notes on the parochial history, and expressed his belief that the two churches spoken of in the records were in fact included in the present structure, adducing some reasons from the arrangement of the building prior to its restoration, the nave having been a complete church, and the whole of the building east of it the other. The party lingered over this curious building and left it with regret.

Proceeding to Broadwater, the large cruciform church was inspected, as were also some views laid out in the vestry by Mr. Tribe, showing the appearance of the chancel prior to a recent destructive restoration, Decorated traceried windows having been removed for the insertion of modern lancets, for the sake of uniformity. There is a central tower supported on arches of Late Norman work, which are insertions in an older Norman wall, there having been no transepts originally.* Sir Jas. Picton pointed out that the western arch, now pointed, had been made up from the ornamental arch stones of a semicircular arch.

Proceeding to the famed ancient British earthwork, Cissbury Camp, some in carriages and some walking up the ascent, the party at length assembled within the bold earthen banks of this remarkable work. The day was somewhat cloudy, but the fine view over the distant town of Worthing and the sea beyond was still very visible. Here a lecture was delivered by Mr. Walter Myers, F.S.A., who, after giving a rapid *résumé* of what had been stated by various writers, proceeded to render a description of the work as it actually existed. The whole surface of the ground enclosed by the earthworks is honeycombed by pits and depressions, which, on being recently excavated by General Pitt Rivers and others, have been found to be the commencement of chambers and galleries, sunk apparently for the purpose of extracting flint from the chalk, of a kind capable of being worked into implements. The whole surface is covered with fragments of flint-flakes, evidently the refuse of primitive workings, and Mr. Myers, after his lecture, led the audience to a heap of flints, all of which had been cast aside as unfit for use after having been split and examined. Mr. Ernest Willett, F.S.A., pointed out the similarity of the work to those known as Grimm's graves, and also the position of some of the galleries, which, going beneath the ditch of the camp a very short distance below it, appeared to show that its formation was older than the ditch itself, which appeared to have been made unconscious of the existence of the gallery beneath.

* It may be mentioned here that the tomb of Thomas, Lord de la Warr, in the chancel of this church, formed the subject of one of the illustrations in our last number.



Saltwood Castle.

Proceeding to the carriages on the opposite side of the hill, the pretty wooded village of Findon was next visited, and the quaint church was described by Sir Jas. Picton. Another halt was made at Clapton Church, where the Rev. — Burnett read some notes prepared by Sir Gilbert Scott on the history of the church and its recent restoration. It is a simple church, consisting of nave, chancel, side aisle to the nave, and a western tower to the aisle, the work being of the plainest kind, though the effect is admirable. Passing the curious half-timbered house at Salvington, where Selden was born, the last halt was that made at West Tarring Church, which was described by Mr. Loftus Brock. The church is of large size, of very plain and good Early English work, the nave having an original clearstory; the chancel is Perpendicular, the western tower flowing Decorated. The latter has a fine tapering spire of timber work covered with oak shingles.

The party then returned to Brighton from Worthing Station, and a meeting was held in the Pavilion, Mr. Thos. Morgan, F.S.A., being in the chair. A paper was read by the Venerable Archdeacon Hannah, vicar of Brighton, on "The Font of St. Nicholas Church, Brighton, in relation to other Early Norman Fonts." A rubbing of another fine font at Grimsthorpe was exhibited by the Rev. G. F. Browne, of Cambridge. Another paper, by Dr. S. Birch, F.S.A., of the British Museum, was then read upon the "Coins of the Ancient British Period, illustrative of Southern England," some fine examples being exhibited by Mr. E. Willett.

We shall continue our notes of the Congress next week.

Illustrations.

SALTWOOD CASTLE.

We give this week views and plans showing restorations and additions recently carried out to the gate-house of this castle for the owner, Mr. William Deedes, under the direction of Mr. F. Beeston, F.R.I.B.A.

The ruins of Saltwood Castle, situated near to Hythe, in Kent, have for years been an attraction to tourists, many of whom must have noticed how unsafe portions of them had become. In 1882, the gate-house portion being closed as unsafe, it was suggested to Mr. Deedes by his architect:—

1. That it might be repaired and left a picturesque ruin.
2. That it might be reinstated in its latest form,—that of a farm-house; or
3. That it might be restored, and with suitable additions turned into a mansion fit for the residence of a country gentleman.

The last suggestion was adopted, and the works were carried out, and this portion of the castle is now occupied by Mr. Deedes and his family.

A small part of the ground-floor story dates back to A.D. 1154, when the castle was rebuilt by Henry de Essex,—Baron Raleigh in Essex; the remainder was the work of Archbishop Courtenay, who, in 1382, again practically rebuilt the castle, his work being probably the earliest specimen on a large scale of Perpendicular work in this country.

Many of the fireplaces and doorways now in use are those placed in the building by Courtenay in 1382; the present lead roofings are at the same levels as the originals, traces of which remained embedded in the old masonry.

The ribbed and arched ceiling of Mr. Deedes's room on the ground-floor, and the circular staircase from the first-floor upwards, date back to A.D. 1154, and the ribbed and vaulted ceilings of the ground-floor tower rooms are as they were left by Courtenay.

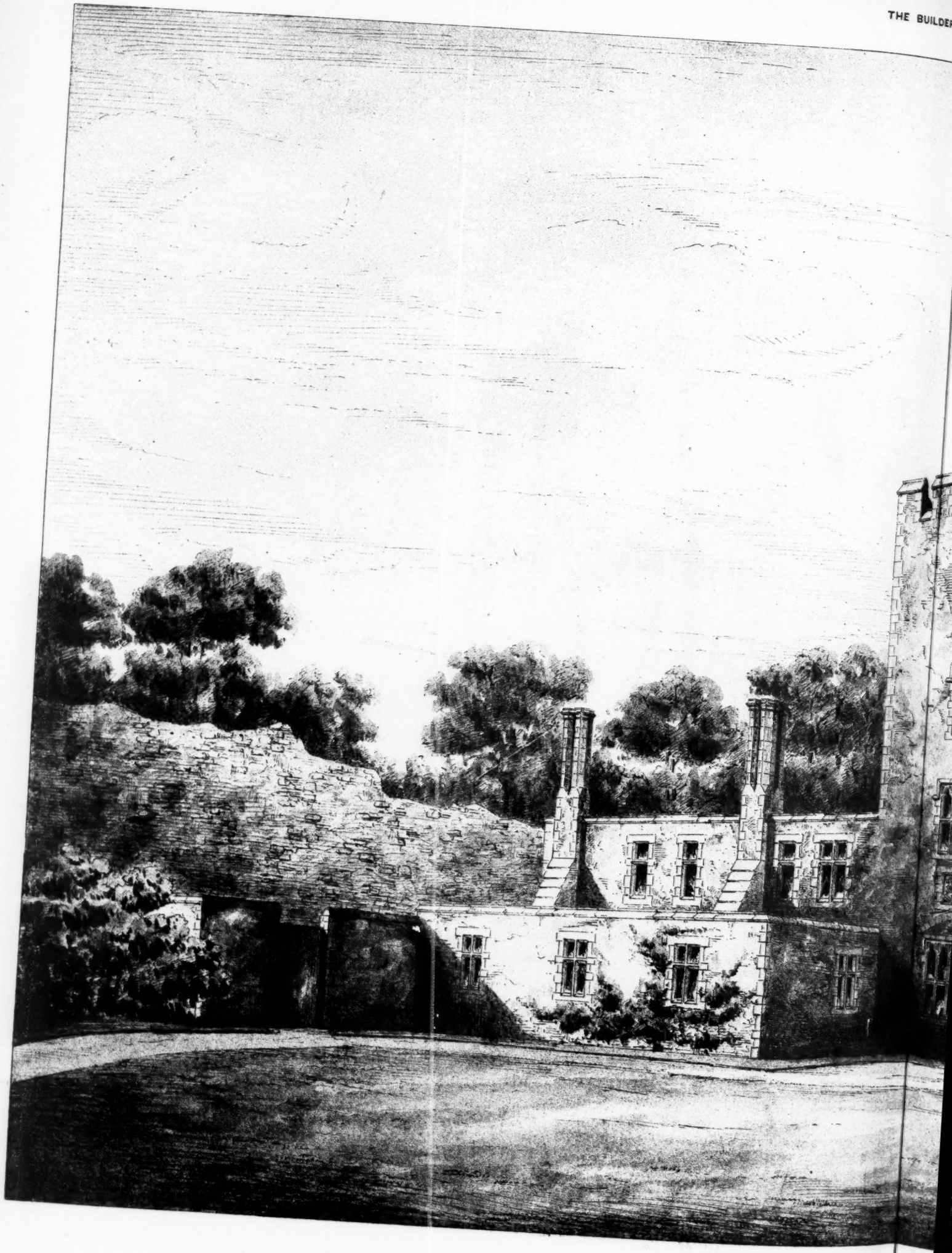
In carrying out the works many workmen's tokens bearing German inscriptions were found, showing from their date that in repairing the gate-house after the earthquake of 1580 German hands had been employed.

In the process of clearing for the purpose of the restorations various disputed questions relating to the architecture of the castle have been set at rest, and many fragments of beauty and interest which had been hidden away for centuries were brought to light.

The restoration was one requiring great care, as the last 20 ft. or 25 ft. of the main building, now upwards of 80 ft. high, was added upon works erected part 500 and part 750 years back, and all more or less injured by the earthquakes of 1692 and 1755. All, however, was safely and satisfactorily completed by the contractor, Mr. T. L. Green, of London; Mr. Edward Addis being the clerk of the works.

CARVING FROM WEST DOOR, ELY CATHEDRAL.

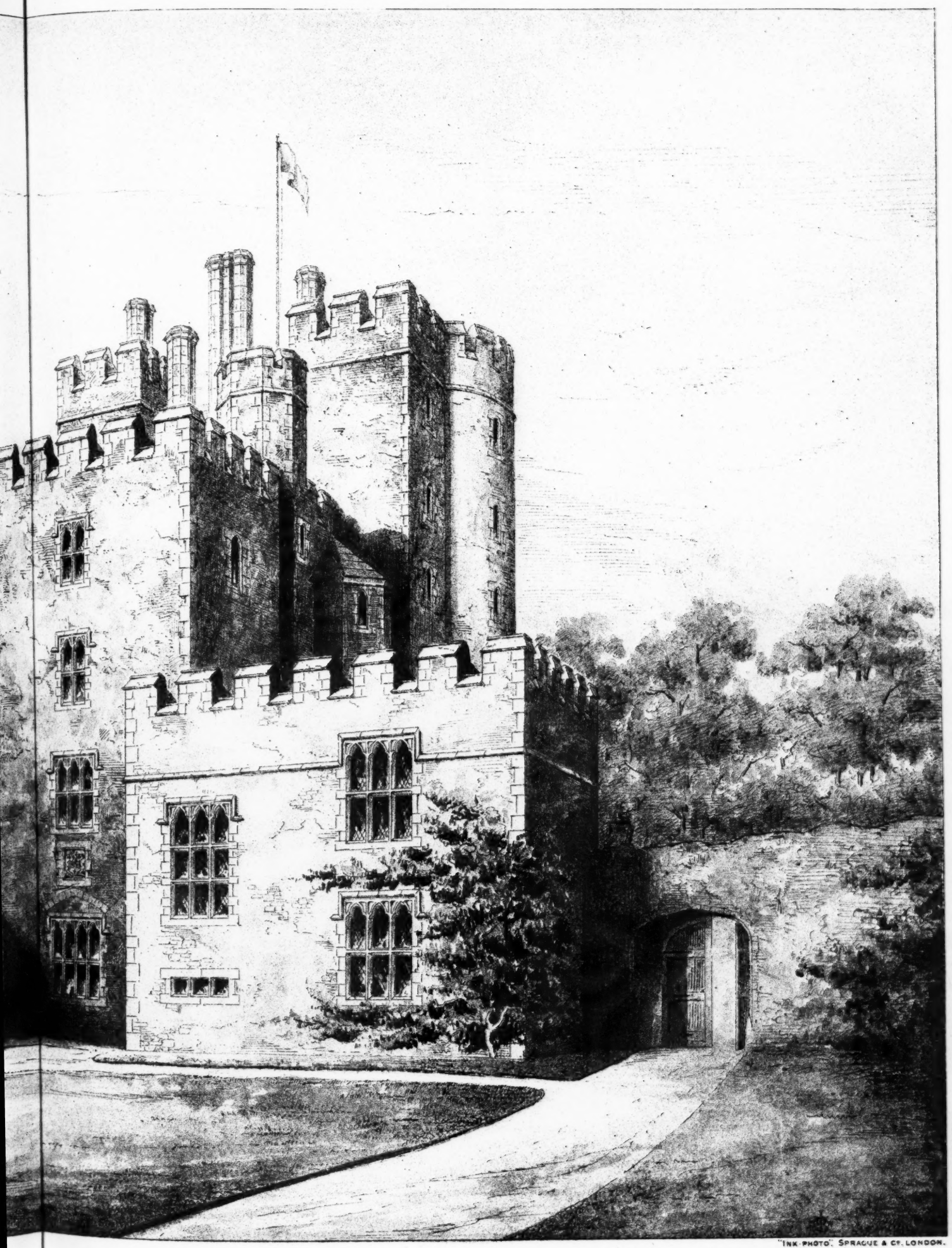
This fine and free bit of Early English decorative work is reproduced from a pencil drawing by Mr. R. W. Paul, whose measured drawings of the sacristy at Bristol Cathedral we published two or three weeks since.



SALTWOOD CASTLE, K

As restored by Mr. F. Beest

Garden Front.



"INK-PHOTO." SPRAGUE & Co. LONDON.

OD CASTLE, KENT;

MR. F. BEESTON, F.R.I.B.A.

GARDEN FRONT.

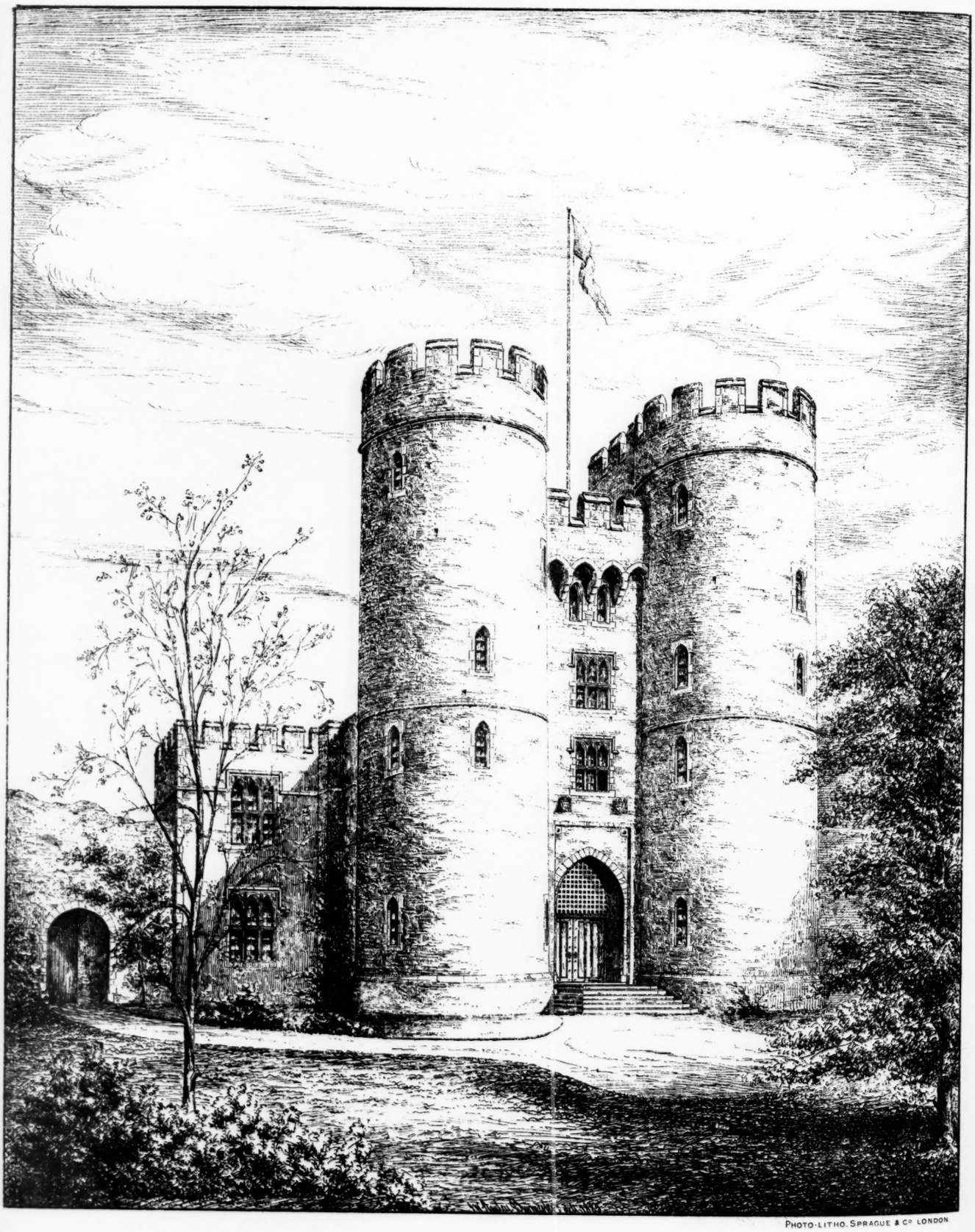


PHOTO-LITHO. SPRAGUE & Co. LONDON

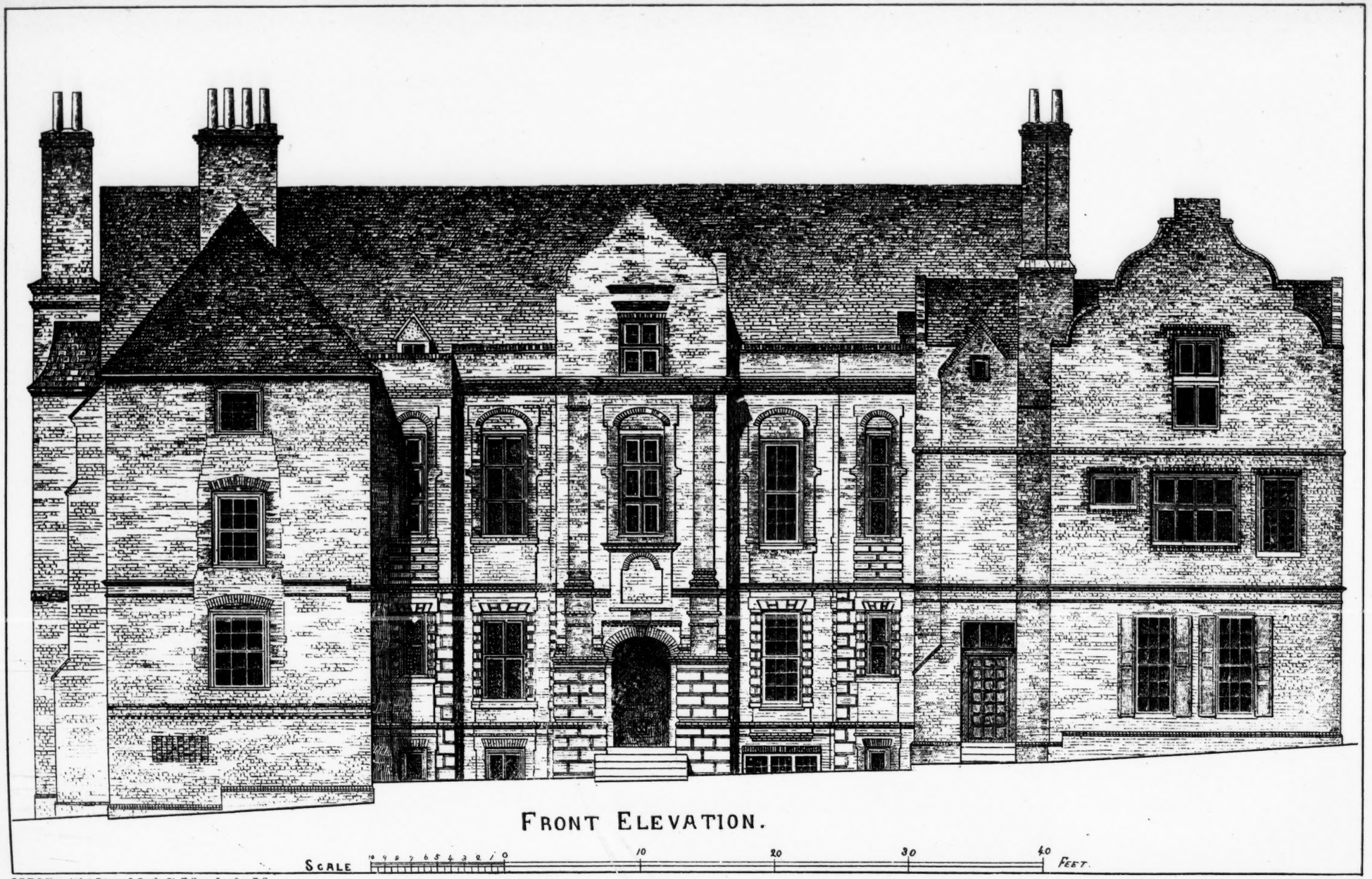
SALTWOOD CASTLE, KENT;

As restored by Mr. F. Beeston, F.R.I.B.A.

Entrance and Gate-Towers.

Carving from West Door.
Ely Cathedral
Sketched from the Cast.

INK-PHOTO. SPRAGUE & Cº. LONDON.

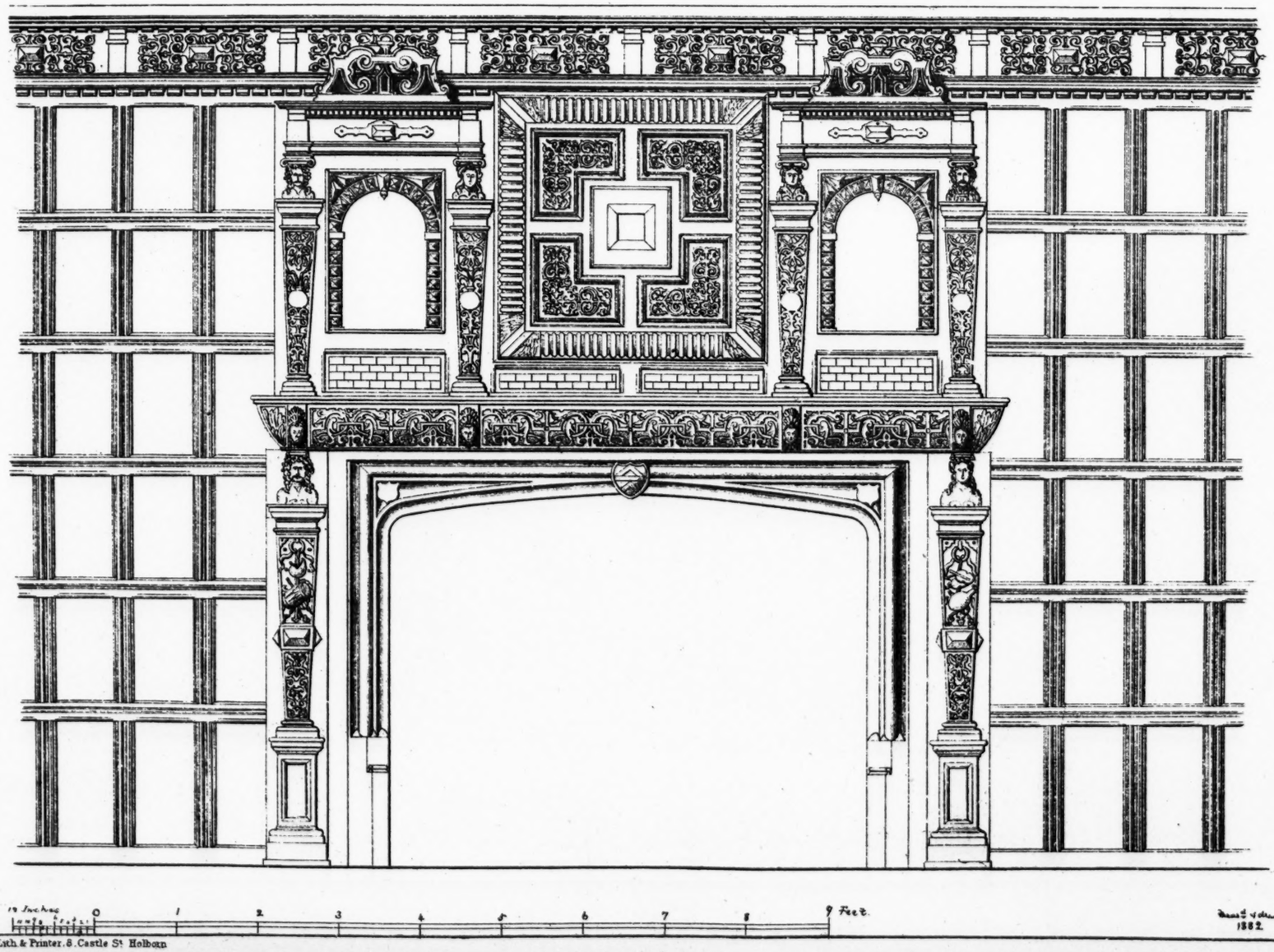


FRONT ELEVATION.

SCALE 10 9 8 7 6 5 4 3 2 1 0 10 20 30 40 FEET.

C.F.Kell Photo-lith & Printer 8 Castle St Holborn London E.C.

RESTORATION HOUSE, ROCHESTER. MEASURED AND DRAWN BY MR. H. BAKER.



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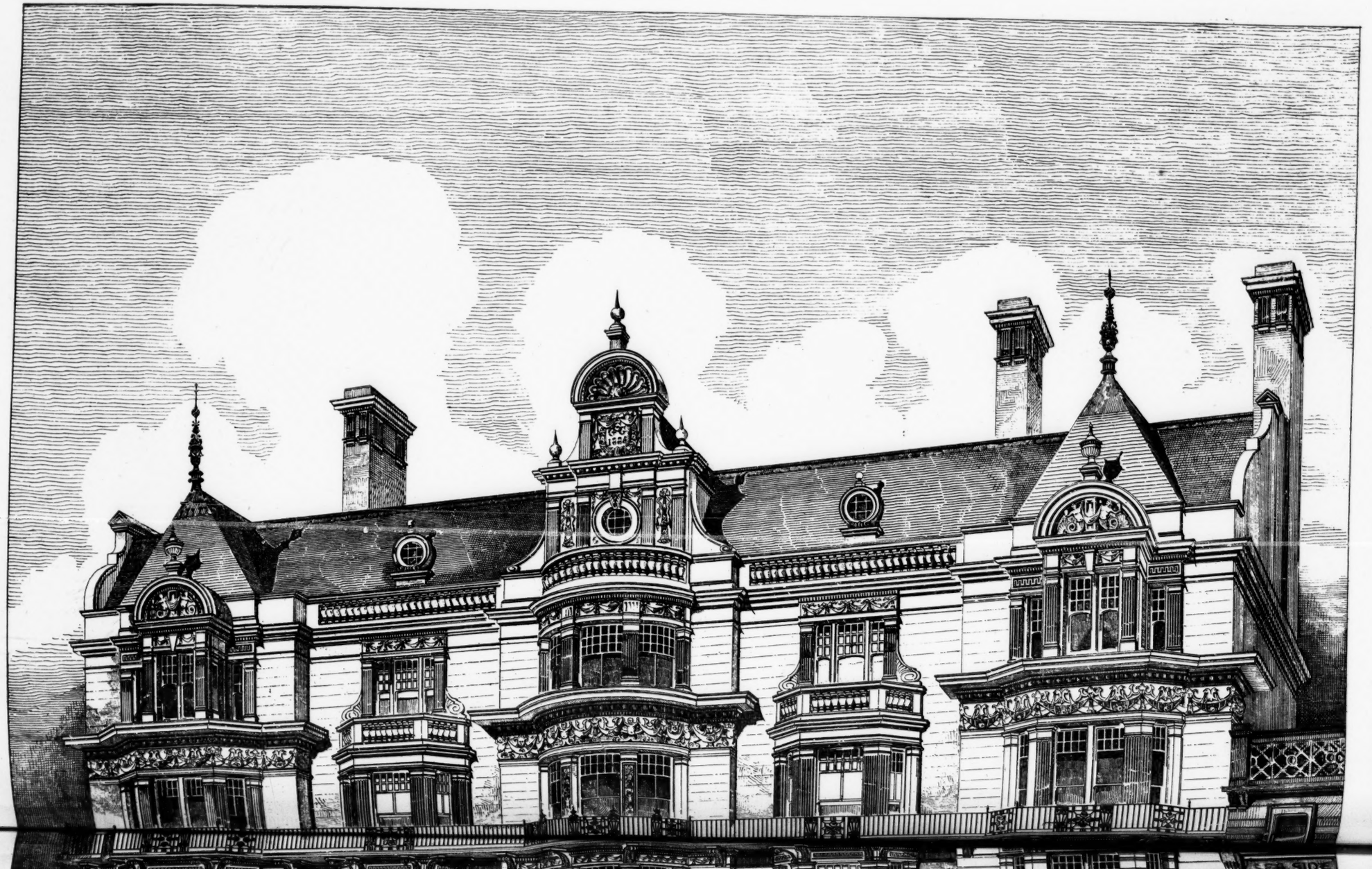
CHIMNEY PIECE, RESTORATION HOUSE, ROCHESTER. MEASURED AND DRAWN BY MR. H. BAKER.

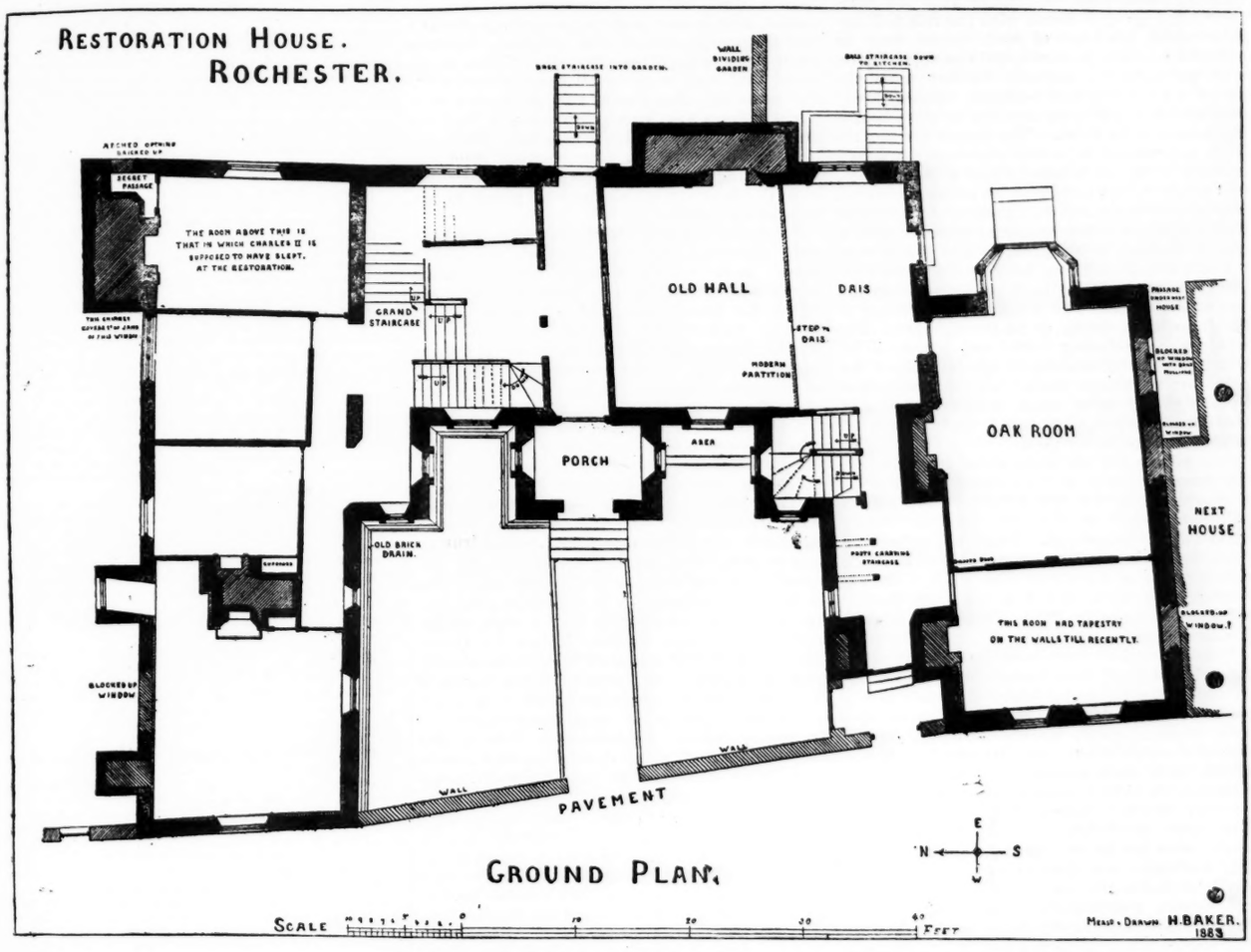


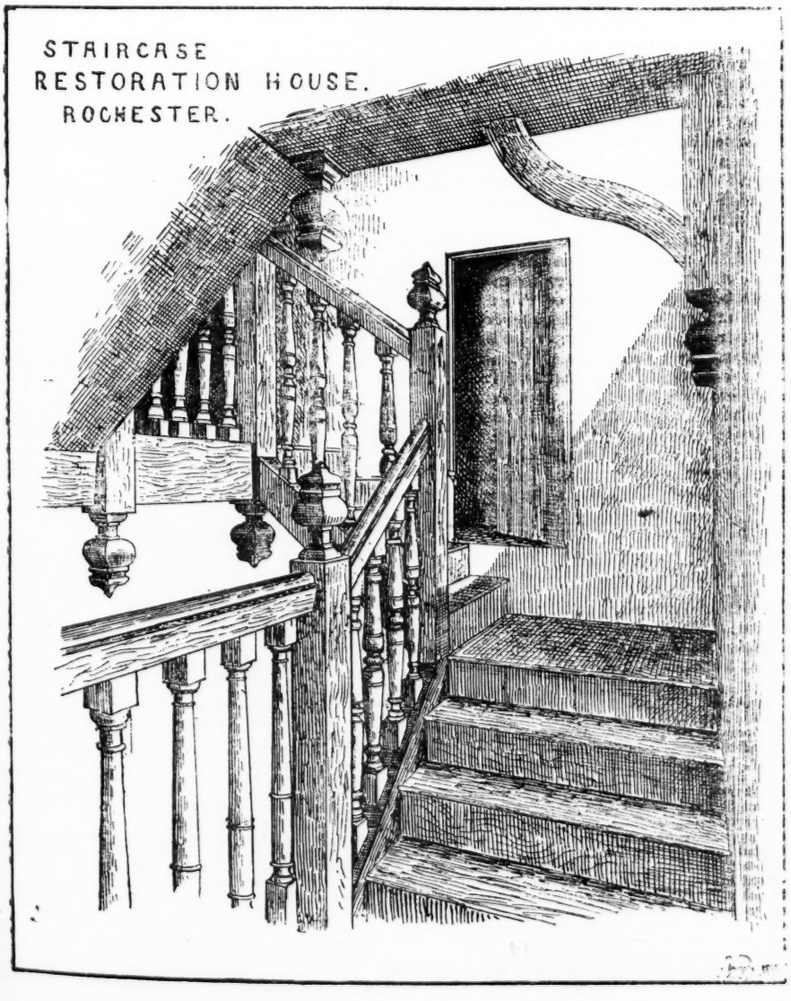
Wyman & Sons, Photo-Litho.

C^t Queen S^t London, W.C.

PREMISES IN COURSE OF ERECTION AT HASTINGS, FOR MR. G. G. GRAY.

MR. ARTHUR WELLS AND MR. MARK J. LANSDELL, A.R.I.B.A., ARCHITECTS.





RESTORATION HOUSE, ROCHESTER, AND CHIMNEY-PIECE THEREAT.

THIS picturesque old house,—which is to be visited by the Architectural Association to-day (Saturday),*—takes its name from the fact that Charles II. slept there on the eve of the Restoration.

It is believed to have been built between the years 1580 and 1600, but it is uncertain by whom. The plan, as will be seen, is in the form of a letter E. The building is of red brick. The centre portion of the front between the two wings is supposed to have been recased and decorated with pilasters and rustic work by Sir Francis Clerke in the middle of the seventeenth century. All the windows of the oldest portion may originally have had brick mullions, one such window having been found blocked up on the south side, but all the rest have oak frames. In the centre of the house is the hall, with a raised dais, and beyond in the south wing is a fine panelled room with a magnificent chimney-piece, Elizabethan in character.

Considerable alterations were made in the interior at the end of the seventeenth century, a new and wide staircase being added, a view of a portion of which is subjoined.

The room in which Charles slept, called the King's Room, is richly decorated in black and gold, and is where Mr. Aveling, the present owner of the house, has discovered a secret passage running from the top to the bottom of the house. He has also found in the basement an underground passage leading in the direction of Eastgate House. A curious feature is the two huge buttresses (?) on the north side, which are large enough to contain a secret passage, but in which nothing has yet been discovered.

"MENTONE MANSIONS," HASTINGS.

THE illustration of the above represents a large block of buildings in course of erection on the site of an old brewery,—more recently used as wine-vaults,—and adjoining premises, at White Rock-place, Hastings, facing the sea. The

* We are asked to mention that members of he Association may obtain retura tickets for the excursion, at single fares, from Mr. A. L. Forrest, 7a, Lawrence Pountney-hill, E.C.

buildings have been planned so that the basements and ground floors, with the full and uninterrupted frontage of each house may be used for business purposes, and the upper floors, with an entrance entirely distinct from the shops, for lodging and boarding houses, easily convertible at any time into one or more boarding houses or an hotel. The houses are accordingly approached by a wide staircase ascending directly to the front doors of two of the houses, and to the others by means of an open covered way or colonnade, but the houses are so arranged that a separate entrance, direct from the street, can, if desired, be adapted, and, in the case of a house and shop being let together, provision has been made for a back staircase from the one to the other. The block has a frontage of 88 ft., with a depth of 80 ft. or more. The whole site, including additional space, 10 ft. wide, under the street paving, is utilised for cellars to the shops. The cellars are approached by a flight of stone steps at the back end of the avenue or arcade of shops, and a large lift is provided for heavy goods.

The pilasters of the shops are of grey granite, the bases, capitals, and entablature of carved Portland stone, the upper part of the houses being rendered in Portland cement, richly carved and ornamented. There are wide York stone balconies and ornamental iron railings, which run the length of each floor. Of the houses, Nos. 1, 2, and 4 are similar, having a frontage of nearly 18 ft. No. 3 is a double-fronted house.

The mezzanine floor immediately over the shops is set back, thus forming the colonnade, on which the front entrances of Nos. 1 and 2 open. Nos. 1, 2, and 4 contain each on this floor a sitting-room, kitchen, scullery, larder, servants' water-closet, and the usual domestic offices, with back entrance. No. 3 contains dining-room, sitting-room, kitchen, gentlemen's lavatory, scullery, offices, and back entrance. The large goods-lift runs up to this floor. Each house has its own lift from top to bottom. The staircases are lighted from the top by a skylight and well. On the first floor Nos. 1, 2, and 4 have a sitting-room the whole width of the frontage and 19 ft. deep, two bedrooms, and water-closet. No 3 has two drawing-rooms (convertible by a raisable partition into one large room, for balls, &c.), four bedrooms, water-closet, and store-closet. On the second-floor Nos. 1, 2, and 4 have a sitting-room, two bedrooms, and bath-room; No. 3, two sitting or front bed rooms, and four other bed-rooms, bath-room, housemaid's closet, and water-closet. On the fourth floor Nos. 1, 2, and 4 have a sitting-room and two bed-rooms, and water-closet; No. 3, six bedrooms, bath-room, linen-closet and water-closet. On the fifth floor, Nos. 1, 2, and 4 have one front bedroom; No. 3, two front bedrooms, four back bedrooms, linen-closet, and water-closet. Nos. 1, 2, and 4 are arranged for lodging-houses, capable of letting a sitting-room and two bedrooms on three floors, and No. 3 specially for a boarding-house.

The work is being carried out by Mr. Arthur Wells, architect and surveyor, in conjunction with Mr. Mark J. Lansdell. Messrs. Taylor Bros., of Hastings, are the contractors, the amount of their tender being 15,995*l.*, the highest being 20,300*l.*

NEWCASTLE SOCIETY OF ANTIQUARIES.

The Newcastle Society of Antiquaries (including Dr. Collingwood Bruce, Messrs. Longstaffe, Bates, Blair, Low, and others) spent a pleasant field-day last week on the Northumbrian coast. The first place visited was Rock Hall, the picturesque residence of Mr. C. Bosanquet, whose grandfather incorporated in the mansion which he built a pele tower of uncertain date, and an Elizabethan house, occupied in succession by the Lawsons and Salkelds. The latter have left traces of their occupation in sundry coats of arms and sundials, and the monument to Colonel Salkeld in the adjacent Norman church (restored and enlarged) commemorates his services in the capture of Berwick. From Rock the party proceeded to Embleton (the mother parish), where the vicarage-house excited much interest. Its eastern portion is formed out of the pele tower built for the protection of the church, and is probably fourteenth-century work. There are [other examples in the county of fortified parsonage-houses, the most notable being Elsdon (described, with much humour, in Archdeacon Singleton's letters to Sydney Smith) and Corbridge (where the original features have undergone little change). There is no proof that they were in all cases occupied by the parochial clergyman, and at Elsdon it is obvious from the inscription upon it that the occupant was the Lord of Redesdale. The basement was generally a large vaulted chamber, and the tradition is that the cattle were driven into it whenever an alarm was given of an approaching raid.

Embleton Church, chiefly Norman, has been well restored; but the chancel, which has lately been wholly rebuilt, contains little worth notice besides the beautiful windows which Mr. Kempe has filled with stained glass to the memory of the Greys of Howick. Within the parish are the ruins of Dunstanborough Castle, second only to Bamborough in picturesque grandeur. They stand upon the edge of a ridge of rocks, at the base of which the sea breaks with ceaseless violence. The area enclosed by the walls is more than nine acres, but it is not easy to trace the position which the extensive buildings once occupied. In fact, little more can be determined with certainty than that the main entrance was on the south side, where two half-ruined drum-towers protect a gateway which in the sixteenth century had been blocked up. The wall, going eastward, is in tolerably good condition, and is terminated at the edge of the cliff by a square bastion, known as Queen Margaret's Tower, and said to have been occupied by Margaret of Anjou after the battle of Hexham. On the north-west side rises a tall tower, built partly of basalt and partly of freestone, known as Lilburne's Tower, and familiar from the place it occupies in Turner's well-known picture. It may be well to remember that that artist has taken some liberties with his subject, and that Buck's view, published in 1728, and recently re-published, is full of error. All that is known of the history of Dunstanborough is that it was built by Thomas of Lancaster, in 1315, and was held by his descendants till the Wars of the Roses, when, after the battle of Hexham, Lords Wenlock and Hastings took it, after an assault of three days, and dismantled it. In the reign of Elizabeth it underwent some sort of repair, and the gateway tower was converted into a residence, the entrance being walled up and access given through a postern on the west side. Lilburne Tower was struck by lightning last year and a good deal of the masonry seems to be in a very perilous position. Within a walk of the castle is a curious pele tower, known as Dunstan Hall, or, from its possessor in the seventeenth century, Proctor's Steads (*i.e.*, home buildings). What its early history may have been there is no evidence to show. Tradition makes it the birth-place of Duns Scotus, and there are indications of architectural work at least two centuries older than the Jacobean manor-house of Proctor. Close at hand are the village and tower of Craster. The latter is, so to speak, embedded in the modern mansion of the ancient Craster family and the only features that have survived are the vaulted chamber now used as a cellar and a newel staircase. A brief visit to the interesting church of Longhoughton, where Mr. Wilson, in opposition to Mr. Longstaffe, held that the chancel arch was of Saxon construction, brought an agreeable day to a pleasant ending.

AWARDS TO EXHIBITORS AT THE INVENTIONS EXHIBITION.

The following is a list of awards to those exhibitors in the International Inventions Exhibition whose exhibits are likely to be of interest to our readers:—

A. B. C. Fence Co. (U.S.A.), 2543,* improved fencing, and machinery for making the same, S.†—Adams, R., 2551, double-action door-springs, S.—Adams & Baker, 289, door-springs, B.—Albo-Carbon-Light Co., 1495, albo-carbon light apparatus, B.—Anderson & Gallwey, 1242, hydraulic riveting machinery, S.—Anderson, G., & Co., 394, steam derrick-crane, S.—Andrew, J. E. H., & Co., 429, gas engines, S.—Aqueous Works and Diamond Rock Boring Co., 176, improvements in rock-boring apparatus, G.—Asbestos Co. (Limited), 547, asbestos packing, S.—Attwood, A., & Co., 1221, self-sustaining lifts and hoists, B.

Banister, F. D., 268, system of concrete construction, S.—Bateman, A. H., 1172, emery grinders, machine tools, and machinery, B.—Baume, W. (France), 2660, rotary and chain pump, B.—Bell, John, & Co., 1961, treatment of asbestos, G.—Bessemer, Sir H., 210c, Bessemer iron and steel, G.—Bower, George, 198, process for rendering iron rustless, S.—Bower, George, 1517, regenerative gas-burner, S.—Bower, J. T., 1764, solid corner brick moulds and adjustable beds, S.—Braby, F., & Co., 264, metal roofing, B.—Bradley, William, 657, locks, S.—Bray, G., 911A, combination water, dust, or slop van, and detaching pole-head, as used by fire-brigade, G.—Briggs & Co., 220, soldering apparatus, B.—Brinjes & Goodwin, 1135, pigment grinding-machine, S.—Bristol Wagon Works Co. (Limited), 720, Margetsen and Hek's patent tip-van, G.—British Association Committee on Screw Gauges, Standard screw-gauges, D.*—British Patent Glazing Co., 89, improvements in dry glazing for conservatories, S.—Broadbent, Robert, & Son, 1149, stone-breakers, S.—Brown & Green, 1535, new church stoves, B.—Brownlee & Co., 216, patent parquet work, B.—Brunton & Trier, 1127, stone-working machines, G.—Burham Brick, Lime, and Cement Co. (Limited), 375, automatic cement-testing machines, B.—Burrows, W. & J., 1567, wine-bins, B.—Burt, Bolton, & Haywood, 1428, Boulton's patent improvements in creosoting timber, G.

Candy & Co. (Limited), 1763, enamelled iron, S.—Carter, John, 290, sliding windows, B.—Chatwood, S., 1232, hydraulic balance banker's lift, B.—Chevrel, G. (France), 3689, machine-made marqueterie, S.—Chubb & Sons' Lock and Safe Co. (Limited), 1817, locks and safes, G.—Clark, T. A. W., 1165, wood-planing machine, B.—Clark & Standfield, 331, floating docks, hydraulic grid dock, and patent slip, G.—Clark, Bunnett, & Co., 1231, safety apparatus for lifts, B.—Coalbrookdale Co. (Limited), 416, Parker & Weston's steam-pump, S.—Constantine, T. J., 1536, improvements in close ranges and stoves, B.—Crampton, T. R., tunnelling machine, S.—Crossley Brothers, 409, gas-engines, G.

Davey, Paxman, & Co., engines and boilers, G.—Davis, John, & Son, 1125, wood-planing machines, S.—De Michele, V., 255, cement-testing machine, B.—Deards, S., 97, dry-glazed conservatory, B.—Dick, Alex., 161, delta metal, S.—Doewra, Thomas, & Son, 137, patent diamond drill, S.—Douglas, Charles D., & Co., 629 and 1836, springless automatic locks, S.—Doulton & Co., 1766, general exhibit of pottery, &c., G.—Duffy, M. C., & Son, 1126, wood block-flooring, B.—Duvigneau, O., & Co. (Germany), 2718, majolica chimney-mantels, S.

Eachus, G. E., 214, ventilating manholes, B.—Easton & Anderson, 254, 402, and 1244, apparatus for water-supply and purification, G.—Ebner, J. (Austria-Hungary), parquet-flooring, S.—Edwards, G. M., 2535A, improvements in building construction, B.—Electric Paint Remover Co. (Limited), 221, paint remover, S.—Electric Power Storage Co., 1305, improvements in secondary batteries, G.—Ellington & Woodall, 591, system for distributing hydraulic power in towns, G.

Fidler, T. C., 388, designs of bridges, B.—Fletcher, Thomas, 1534, gas fires and furnaces, G.—Foxall, Llewellin, Jones, & Co., 1524, dry gas-meters, S.—Freeman, J. B., & Co., 1448, "non-poisonous" white lead, B.—Frere, N., 341, pipe-jointing, B.

Glover, W., & Son, 728, patent tipping-van, S.—Grafton & Co., 397, patent slewing gear for cranes, S.—Griffiths, Thomas, 1443, substitute for white lead, B.

Harris, J. F. & G., 1699, mouldings and fancy wood decorations, S.—Heath, Captain W. E., 281, method of shoring up dangerous structures, S.—Hembry & Co., 1682, wall coverings, B.—Howard & Sons, parqueteria, S.—Humpherson, F., 222, flushing cistern, B.—Hydraulic Engineering Co. (Limited), 1199, hydraulic engine, hydraulic balance direct-acting lift, and water-saving arrangements applied to hydraulic machinery, G.

Improved Wood Pavement Co. (Limited), 403, street paving, S.—Indestructible Paint Co. (Limited), 960, Browning's preservative solutions and paints, S.

Jeffrey & Co., 1673, embossed leather and embossed leather paper, S.—Jeffries, A. & C., 1720, mouldings, B.—Jelley, Son, & Jones, 1808, sash-fastenings and door-handles, B.—Johnson, W., 253, economical brickmaking machine, B.

Kent, G., 261, water-meter, S.—Kent, G. B., & Sons, 2526, automatic brush-boring machine and brushes, S.

Lindsay, W. H., & Co., 266, fireproof flooring with steel girders, S.

Macpherson, Donald, & Co., quick-drying paints, B.—March, W., & Co., 332, road sweeper and elevator, S.—Marsden, H. R., 1129, stone-breakers, G.—Marshall, Sons, & Co., high-speed engine, S.—Merryweather & Sons, 1279, steam fire-engines and appliances for use in extinguishing fires, G.—Millis, C. F., 2309, application of the principles of descriptive geometry to the cutting of sheet metal, G.

Parry, William, 376, bricks for preventing penetration of water, B.—Patent Liquid Fireproof Cyanite Paint Co., 1449, coloured cyanite, S.—Patent Mycenian Marble Co., 271, Mycenian marbles, B.—Pulham, James, & Sons, general exhibit of concrete, stoneware, &c., S.—Pulsometer Engineering Co. (Limited), 1201, Pulsometer steam-pump, Deane pump, and "Thames" filter, G.—Putney, Alfred, 382, wood-flooring, B.

Ransome, A., & Co., 1124, cask-making machinery and tree-felling machine, G.—Rendle, W. E., & Co., 90, improvements in dry-glazing for conservatories, S.—Reynolds, F. W., & Co., 1234, cheap wood-working machinery, S.—Rhodes, J., & Sons, 150, sheet metal-working machinery, S.—Rust, J., 1781, vitreous mosaic, S.

Sagar & Co., 1128, wood-working machines, S.—Sage, F., 2103, workmen's time check, S.—Selig, Sonnenthal, & Co., 1216, turret head lathe, S.—Shand, Mason, & Co., 1278, steam fire-engines and other appliances for use in extinguishing fires, G.—Siemens, F. (Germany), 2720, tempered glass, G.—Simpson, W. B., & Sons, 276, decorated enamel iron and Anglo-Limoges enamels, G.—Slate Débris Utilisation Co., 379, manufacture of commercial products from slate *débris*, S.—Smith, A., & Stevens, 1245, hydraulic balance and hydraulic balance lift, S.—Smith, Hugh, & Co., 1198, hydraulic riveting machinery, S.—Stanley, W. F., 2175, improvements in philosophical instruments, G.—Steel & Garland, 1542, Wharncliffe ventilating grate, S.—Storey Bros. & Co., 1749, washable wall covering, B.—Sugg, William, & Co. (Limited), 1479, collective exhibit of gas apparatus, G.

Tangye Bros., 1202, special steam pump, automatic condenser, and hydraulic jacks, G.—Tayler, R. W., 372, automatic scavenger, S.—Tighe, C., 237, door handles, B.—Tobitt, T., 310, window sashes, B.

Venice and Murano Glass and Mosaic Co. (Limited), 2699, enamel mosaics, G.—Verity Bros., 1823, builders' fittings, S.—Vincent, William, 727, tip cart, S.—Vincent, William, 727, joint facing bricks, B.

Warner, J., & Sons, 1197, chain pumps, bell buoys, and beacons, B.—Watson, J., 357, cement kiln, B.—Watts, J., & Co., 1146, band-sawing machine, G.—Waygood, R., & Co., 1200, hand lifts and continuous passenger and goods

* The numbers are those in the catalogue.

† The letters B, G, or S, indicate that bronze, gold, or silver medals have been awarded.

* The letter D signifies Diploma of Honour (awarded only to Government Departments and Public Institutions).

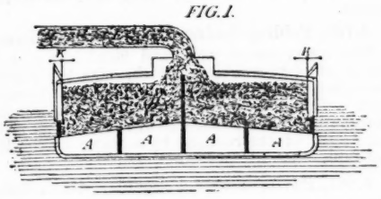
lifts, S.—Wenham Patent Gas Lamp Co. (Limited), 1497, regenerative gas-burner, S.—Willett, Samuel, 296, safety sash-fastener, B.—Wilson, D., 229, drying slurry, B.—Woollams, William, & Co., 1662, embossed leather and torgorine, B.—Worssam, S., & Co., 1130, wood-working machinery, G.

Yale and Towne Manufacturing Co. (U.S.A.), 2580, locks, G.

ANOTHER SHORT WAY WITH THE LONDON SEWAGE.

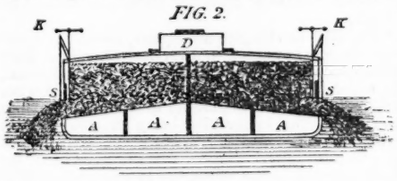
A SCHEME has recently been suggested by Mr. Page, a wharfinger and shipowner in the port of London, for disposing of the sewage of London, which at least has the merit of simplicity and being capable of realisation in a short time and at no great outlay. The plan is to construct a steam vessel of, say, 4,000 tons register tonnage, having 60 ft. beam and 300 ft. length, with a ballast hold all along the keel level (*A*, *A*),—which is, in fact, a pontoon,—into which water may be taken as ballast if required. Over this hold is another formed of a series of tanks

FIG. 1.



for the reception of the sludge. These tanks, too, run fore and aft the whole breadth of the vessel, each tank being separated from the other by water-tight bulkheads, having manholes on deck to each, and when the tanks have been filled through the manholes the latter are hermetically closed to prevent the escape of any noxious gas or smell. The deck or floor of

FIG. 2.



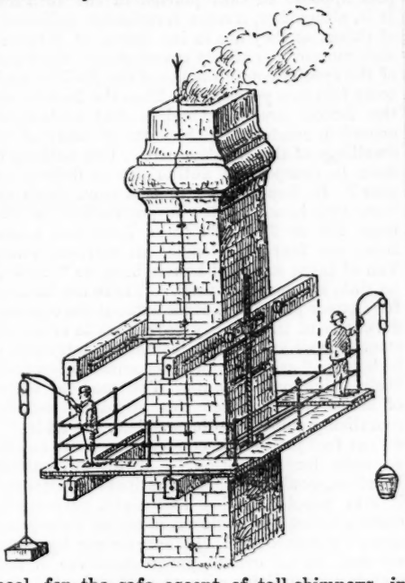
these tanks slopes towards the sides of the vessel from the central longitudinal line at an angle of 3 ft. to 4 ft. in 30 ft., and at certain distances in both sides of the vessel there are sluice ports (*S*) worked from the upper deck (*K*), so that when the vessel has arrived at her deep-sea destination these sluice ports being opened simultaneously the whole cargo immediately begins to rush into the water by its own gravity aided by the sloping floor, whilst at the same time, by the action of the ballast hold, or pontoon, the vessel rises by her own buoyancy, and so always maintains a uniform pressure of 5 ft. to 6 ft. above the load-line upon the cargo, whereby the whole is discharged without the application of pumps or other mechanical means. When the cargo has been discharged, the steam pumps can be applied and the tanks thoroughly cleansed in a very short time, and the vessel return for another cargo.

It is considered that two such steam vessels of 5,000 tons displacement, 300 ft. long, and 60 ft. beam, would be amply sufficient to take the whole of the sludge out to sea every day; one vessel being loaded by the powerful steam pumps at the reservoirs, and sent away when full, and the other then coming alongside to be filled and sent away in its turn.

Public Health (Metropolis) Bill.—Few circumstances tended more to increase efficient sanitary admiration throughout the country generally than the consolidation under the Public Health Act, 1875, of all the sanitary laws then in existence. But the metropolis has always had exceptional legislation, and this legislation is spread over a number of Acts, and is even contained in isolated clauses in general Acts, the result being that there are but few persons who have a detailed and accurate knowledge of the sanitary law as applicable to London. The Government have, therefore, done well to introduce the Public Health (Metropolis) Bill, which is really an Act to consolidate, with certain amendments, the Acts relating to nuisances, infectious diseases, and other allied matters in so far as the metropolis is concerned.—*Lancet.*

THE "CLIMAX" CHIMNEY CLIMBER.

THE accompanying cut gives an illustration of what appears to be a very useful invention, patented by Messrs. Brown & Porter, of Liver-



pool, for the safe ascent of tall chimneys, in place of the old "steeple-jack" business. The following is the description furnished to us by the patentees:—

"The arrangement consists of two stout timber grippers capable of being secured to the chimney to be climbed by means of two long bolts, one on each side the chimney; to these upper grippers are suspended (by means of four chains) two others precisely similar capable also of being bolted to the chimney, and to the latter is attached the stage. The lower and upper grippers are also connected by means of two steel screws 2 in. in diameter. The operation of climbing the chimney is as follows:—Supposing the upper grippers to be screwed fast, and the lower ones to be loose, then the weight of the stage is being sustained by the chains; the two screws are now operated, and the stage is thereby gradually raised; when the desired height is reached, the lower grippers are secured by tightening up the bolts, which takes off the weight from the upper ones, so that the latter can now be raised to a greater height by simply working the screws the reverse way; when the chains are again tight, the upper grippers are secured as before, the lower ones released, and the operation of lifting is continued."

SCREWS—COMMON AND IMPROVED.

NEXT to nails, there is in carpentry work no article more largely used than screws; but unfortunately the screws employed in this country are mostly of patterns as old as the hills, and screws are made now much as they were fifty years ago, with the screw thread cut out of the blank. The Harvey patent rolled screw is a marked improvement on the old and orthodox weapon. The machine for making these screws is exhibited at the Inventions Exhibition, by Messrs. J. H. Ladds & Co.; it is very ingeniously designed, and performs its work with admirable ease and accuracy. It is, however, to the screw produced that the highest interest attaches, for it possesses qualities of practical value, and displays the greatest advance yet made in the form and manufacture of this most serviceable article. In the first place, the gimlet, always needed as a preparer of the way for the common screw, is no longer needed for the Harvey screw, which, being gimlet-pointed, will screw itself into even such hard woods as beech, oak, and mahogany. Anything that will facilitate the use of screws instead of nails, must be a boon to every one who has to employ a carpenter, for it is not everything the carpenter puts together that is intended never to come apart. Again, it is one of the uses of screws to bring portions of materials closely and firmly together, and to hold tight in the wood. The ordinary screw is made taper in the thread portion; the Harvey screw is parallel for all the screw portion except the gimlet point, consequently it has double the grip of the common screw upon the material into which it is inserted. A further good quality of the Harvey screw is that the neck is of smaller diameter than the thread portion, the screw being pressed out and not cut like the common screw, whereby the fibre of the metal of the blank is greatly weakened. This mode of formation by permitting the use of a smaller blank economises the metal. Thus, for example, whereas under the old system one ton of wire would produce 1,066 gross of No. 10 screws, the Harvey machine will turn out 1,800 gross, a gain of 734 gross in the one ton of metal. The machine produces the screws at the rate of a gross a minute. The number of common screws now used in England is said to be 130,000 gross per day. So that there is in screws an industry capable of returning considerable profits to an inventive genius.

THE LATE PROFESSOR DONALDSON.

SIR,—There are, I am sure, many of your readers who have at one time or another been students under the late Professor Donaldson, and who must now feel with myself that they have reaped great benefit from his instructions, and, perhaps, as much from his example and influence; and not a few will be able to recall, as I gratefully do, subsequent acts of friendly kindness, done with an amount of hearty cordiality which added to the value of them. There is, perhaps, some appropriateness in my being the one from among those to ask for a little space in your columns in which to refer to Donaldson's work as Professor of Architecture at University College, London.

As the first professor of architecture,—not only in that college, but, so far as I know, in Great Britain,—he had the task, by no means a simple one, of originating the whole course of instruction. It probably may not have even been quite clear at that day to others, if it was to himself, that architecture and construction were arts a knowledge of which could be usefully communicated through the medium of lectures, and Donaldson had to show practically that it could. He had to decide what to teach and what to leave aside, and to originate the entire method and system, and he showed excellent judgment in the curriculum which he planned and the methods which he adopted, while he was untiring in his perseverance and attention in carrying them out.

I do not think that lecturing gave Professor Donaldson much trouble. He had full notes, and though he did not read his lectures, he, I think, trusted a good deal to the notes. He used to give four lectures a week, and, at least in my time, always wore his gown to lecture in. He obtained the ear of the students from the first, and used to insist on their taking notes, and gave advice as to how best to do it. He used frequently and with facility to sketch on the black-board, and used to expect us to copy the sketches so used.

Many plans were adopted, most of which are retained to the present day, in order to add to the interest of the lectures, such as an occasional examination, a visit to such a building as St. Paul's or Westminster Abbey, and perhaps the offer of a prize for an essay or drawing.

You, in your notice of him, speak of the fine collection of illustrations of the best examples which he formed. A large proportion of these were vigorous drawings, tinted with much effect, and to a very large extent the work of his own hand. I remember his once saying to me that he wished these diagrams to serve something of the purpose of a school of art, as well as a series of examples. He was, as you have pointed out, always willing to lend any of these diagrams to any professional friend, most of all to an old student who was about to attempt a lecture on some architectural subject, and on such occasions he was most generous. But any or all of the diagrams were placed at the disposal of us students,—that is to say, any of us might borrow any diagram for the purpose of study at home, and this unusual but wise liberality doubled the value of the course of instruction to those who availed themselves of it.

This custom has been kept up by Prof. Lewis with regard to the very numerous and excellent diagrams which he prepared, as well as those of Prof. Donaldson's, which were in his charge, and it is still continued. A year or two back, Prof. Donaldson presented to the College a large mass of valuable drawings and engravings illustrative of architecture, for the purposes of this class, and, as was pointed out by you, a Donaldson Medal was founded as a prize in each of the courses of Architecture and Construction.

Donaldson would spare no pains in answering our questions and clearing up our difficulties, and was always accessible to any of the students who wanted guidance; and this, with his evident devotedness to our benefit served to attach his students closely to him. I remember that, in the class of which I was a member, we set on foot a subscription to purchase some token of respect that should be presented to him at the close of the session, but he somehow found it out, and told us that he should not consider it right to accept such a gift, so the project fell through; but I am glad, at this long distance of time, to remember that we had sufficient sense of his arduous and unremitting exertions for our good, and of his great generosity and liberality, to have set it on foot.

T. Roger Smith.

University College, London.

INVENTIONS EXHIBITION AWARDS.

Sir,—As the "Inventions" Exhibition awards are now being made public, and many persons are forming their opinions of the merits of the exhibits from the decision of the jury, I think it should be known that the jury commission hold that two persons can constitute a jury.

Having ascertained from the secretary that such was the case with regard to my exhibit, I withdrew from competition on the ground that two persons could be judges, but not a jury. As the jury commission invited exhibitors to nominate members, some might have been judged by two of their nominees, while others may have suffered from the lack of collective wisdom implied in the word "jury."

A Dissatisfied Exhibitor.

HOUSING OF THE WORKING CLASSES.

Sir,—Inasmuch as you think I am in error about one cause of the wretched dwellings of the London poor, and that in suggesting some regulation of street trading I am proposing an impracticable and absurd method of reforming the habits of the occupiers of these houses, may I request the favour of the insertion of the subjoined extract from my report, in order that your readers may judge for themselves?

I may add my opinion that the Holborn Board of Works has, for its size, applied the Artisans' Dwellings Acts to more houses than any other Sanitary Authority in the metropolis. Torrens's Act has been applied to 401 houses, and there have been four "representations of unhealthy areas" under Sir Richard Cross's Act.

Septimus Gibbon, M.D.,
Medical Officer of Health.

Sanitary Department, Holborn Town-hall, Gray's Inn-road, W.C.,
Aug. 18, 1885.

Extract from my Annual Report.

"The worst of the tenemental houses in our district are certainly occupied by such traders as costermongers, flower-sellers, newspaper girls and boys, match and fusee sellers, street singers and musicians, thieves, beggars, and prostitutes. It may be necessary and expedient to have perishable articles of food, such as fish and vegetables, hawked about the public thoroughfares for sale, but I think the hawkers should be duly licensed by some authority; at present, none of them ever take out a hawker's licence. If this trade was subjected to regulation, it would be greatly to the advantage alike of the traders themselves and of the general public. Besides the vocations of thieves, beggars, and prostitutes, there is much of this street-trading that is very demoralising to the persons engaged in it. This is proved by the fact that it is well-nigh impossible for the landlords to prevent the houses in which they dwell from being stripped of all their available metal, woodwork, taps, and other sanitary fittings. As I stated last year, it is of little permanent advantage to cleanse the 'rookeries' unless effectual and practical measures are taken to reform the 'rooks'; and this, in my judgment, can only be done by legislation."

"It is much to be regretted that the Royal Commission on 'The Housing of the Working Classes' did not inquire into this and other real causes of the indecent, demoralising, and unhealthy homes of the poor. I am inclined, therefore, to dispute the main outcome of the Commissioners' suggestions, which may be briefly comprehended in this saying of their own:—'There has been failure of administration rather than in legislation. What at the present time is specially required is some motive power.'"

*** The Royal Commission was instituted to inquire into the housing of the poor. The question suggested by Dr. Gibbon is obviously out of their purview.

Memorial.—Mr. W. C. May has executed a life-size marble bust of the late Canon Pearson, which is shortly to be placed in the Chapter Library at Windsor Castle.

THE HOUSING OF THE WINDSOR POOR.

Sir,—The report of the special commission of the *Lancet* on the homes of the Windsor poor appears in that journal of the 15th inst. It is, altogether, a most formidable indictment of things as they are in the slums of Windsor; and, moreover, entirely corroborates the report of the special commissioner of the *Builder* made some fourteen years ago. Thus the *Builder* and the *Lancet* are in complete and undesigned accord in condemning the state of many of the dwellings of the Windsor poor. Can nothing be done to compel the authorities to deliver our poor? In South-place in this town there are forty-two houses, with a population varying from 170 to 210. To these forty-two houses there are fourteen closets, all without water. Ten of these so-called houses have no "backs," no sink, no closet, no privy. There are in these ten houses just fifty people without the common decencies of life. They have thus to cross the street for all sanitary or insanitary purposes,—to beg, or "crib," or filch, accommodation from their neighbours' closets. The medical officer of health admits that this appalling and demoralising state of things exists, but adds, "I do not feel justified in condemning these houses as unfit for habitation." What, sir, outside Windsor, would be held to constitute "unfitness," if fifty people, by day and night, perpetually casting about for a closet, is not an outrage on morals and decency? Is there no way by which we can, at all events, purge ourselves of any seeming complicity with the official mind that "does not feel justified" in condemning such horrible "homes" as these.

Arthur Robins, M.A.,
Rector of Holy Trinity, Windsor.

August 17th, 1885.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

4,997, Ventilating Buildings, &c. T. Clayton.

A vane made of a number of spiral plates forming compartments so as to resemble a double or treble pitched screw rotates in suitable bearings, and is fixed into a casing in the box of the ventilator. The end of the casing runs in a groove, formed in a circular rim. By means of a screw, lock nut, and collar the casing may be adjusted so as to easily run in the groove. The box is about half filled with water. The foul air enters through an opening communicating with the space to be ventilated, and being caught by the compartments of the vane which are out of the water is kept trapped until those compartments leave the water on the opposite side, when it is allowed to escape through an outlet. The vane may be made to work horizontally or vertically, and the water may be dispensed with, in which latter case the casing runs in a groove on the drawing-in side, and is made adjustible on that side.

5,277, Warming, Ventilating, and Disinfecting Hospitals. V. H. Dale.

Foul air is drawn off to main pipes in the ceiling by means of branch pipes opening to the ward or room, and passes by a flue to the extractor. Here the noxious germs in the air are destroyed by contact of the latter with metal tubes, through which hot air from the gas or from any gas-heater passes. A gas regulator maintains the temperature at a uniform point. The heated and purified air from the extractor is conducted by a pipe below the floor to the end of the ward and back again to an outlet shaft. Fresh air admitted by suitable inlets to an air-chamber or passage surrounding the heated pipe becomes warm and escapes to the room through branch pipes and gratings.

6,818. Picture-rod and other Hooks. E. Tonks.

The larger end of a double hook is bent over a picture, and the cord suspending the picture is passed over the lower hook. In order to prevent the upper hook from coming off the rod, a double-headed pin falls, or is pressed by a spring, across its mouth. Instead of at the extremity of the upper hook, the pin may go through the middle of the hook, or it may be dispensed with entirely, a bowed spring riveted to the middle of the hook serving the same purpose.

7,008. Earth-plate for Fencing Standards. T. Mailer.

The earth-plate has its opposite ends bent at right angles. Bands or strips are punched or stamped out; and between them and the middle strip lying at the back of the plate, the standard is placed and held by a pin.

7,395, and 7,397. Concrete. J. A. Jones.

These two patents both refer to the use of blast-furnace, or annealed slag and whinstone, which are ground, incorporated with Portland or other cement preferably in a mortar or pug mill, and moulded for use in paving or the like. The second specification has water added.

8,042. Picture-nail. R. Collard.

A removable head is built up of three pieces, viz., the ornamental front, the dished piece, which is attached to the front by bending over the edges, and has a ledge to support the third piece, which is in the form of a disc. The first piece has an opening cut in it to receive the stem of the nail, and the disc has a depression to bear against its head. The elasticity of these pieces securely holds the nail to the complex head.

10,144. Mosaics and Stained Glass. H. F. Belcher.

Pieces of glass or other mineral substances are arranged on a table in the form of the desired design, with spaces between all the pieces. A sheet of gummed asbestos is applied to the pieces, which are then removed adhering to the sheet, and a second sheet is caused to adhere to the other side. The sheets are then placed in frames, and molten metal poured in, which, when the metal is cool, unites the pieces altogether in the glass, and the asbestos may be heated before the metal is poured in. The sheets may be pressed into contact with the glass or other pieces, and grooves may be formed in the sheets to produce strengthening bars across the frame.

4,799, Folding Ladder Fire Escape. J. Imms.

The rungs are of wood, and fitted into eyes, in strips of girth-webbing, which, with the jointed links, constitute the sides. The ladder is lowered from a window by a rope, and suspended from hooks permanently fixed to the wall of the chamber. It is kept clear of obstructions by a frame which folds outward.

5,881, Paving Blocks, Parquetry, &c. J. Robb, Glasgow.

Tiles or blocks of wood are grooved in their edges, and long slip feathers are inserted in the grooves to connect the blocks together. The grooves running in one direction are in a different plane from those crossing them, so that the feathers may pass each other. The separate blocks are connected together to form slabs, the ends of some of the feathers being left projecting to attach the slabs to one another.

6,359. Metallic Roofing Tiles. J. Mott, New York.

The tiles or shingles are square, and are laid with one diagonal running in a vertical direction. They have a central hollow rib along the vertical diagonal, in which is a small slot near the point, and have two ribs near the corners parallel to the first, the lower portion of the latter ribs being cut away so that when the tiles overlap, a space is left through which to put a fastener. Hollow ribs are stamped in the body parallel to the sides, the two lower ones being larger than the others, in order to fit over the corresponding upper ones of the next lower course. The nail-holes are placed so that they are all covered by the overlap of the tiles in the course above. At the lower points of the tiles, a fastener extends under the two tiles beneath, and has projecting through the slot in the central rib a piece of metal which is bent over to fasten down the point.

6,817. Fireplaces. H. Westman.

A shield is placed above the fire to regulate the draught. Its bottom corners rest upon the top bar, forming the fulcra about which it swings. It is pulled forward and held in any position by a toothed quadrant, allowing the air which would otherwise pass through the fire to escape through a small aperture left between the shield and the mantel jamb.

8,116. Imitation Wood. F. Thiemer.

Sawdust, wood shavings, straw, or other ligneous substances, are moistened with zincic chloride and then impregnated with basic magnesic chloride. The substance is afterwards pressed into moulds and dried. The resulting material may be worked like hard wood, takes a good polish, is not easily burned, is impervious to water, and resists the action of weak alkalies and acids.

APPLICATIONS FOR LETTERS PATENT.

July 31.—9,171, W. Walker and others, Fluid-tight Joints for Pipes.—9,209, C. Rowlands, Improved Sawing Machine.—9,210, W. Frost, Window Sashes and Frames.—9,211, H. Gibbs, Improvements in Flushing Water-closets.—9,215, H. Doulton and J. Slater, Embossing and Decorating Window and other Glass.—9,221, W. Scott-Moncrieff, Rain-water Flushing Apparatus.—9,222, A. Fullicks, Manufacture of Blocks and Slabs for Structural and Ornamental Purposes.

Aug. 1.—9,239, B. Stockman, Improvements in Water-meters.—9,244, A. Boult, Machine Tools for Working Stone.—9,261, R. Boyle, Stoves, Fire-grates, &c., for Heating and Ventilating Rooms.—9,262 and 9,263, R. Boyle, Ventilation.

Aug. 4.—9,276, R. Munn, Ventilator.—9,278, M. Stephenson, Coupling and Uncoupling Pipes.—9,297, B. Mills, Improved Joint for Pipes.

Aug. 5.—J. Denny, Soffit Lock Tiles for Ceilings, &c.—9,353, W. Lake, Improved Disinfectant.

Aug. 6.—9,370, J. Wailes, Apparatus for Cutting or Excavating Drains, Trenches, and Ditches.—9,379, S. Furnival, Composite Moulds for Moulding Plastic Articles.—9,389, J. Day and T. Wrigley, Locks, Bolts, &c., for Doors, Shutters, &c.

Aug. 7.—9,403, W. Thompson, Improvements in

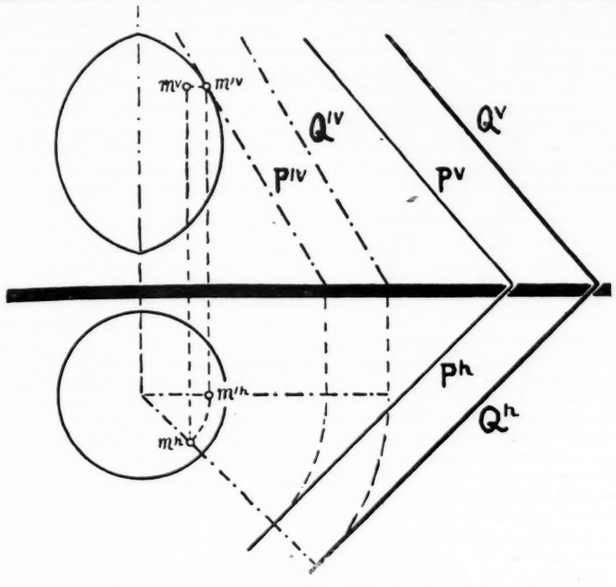


Fig. 144.

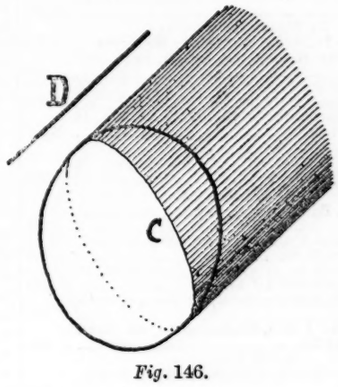


Fig. 146.

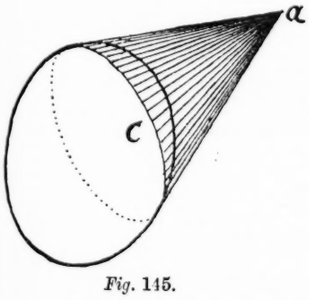


Fig. 145.

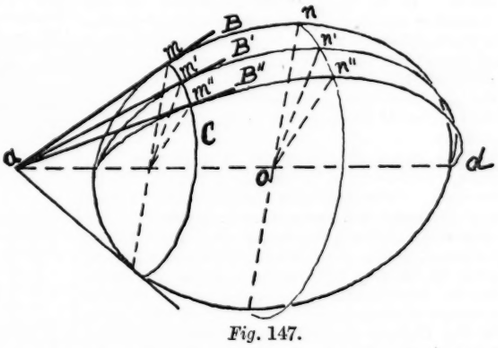


Fig. 147.

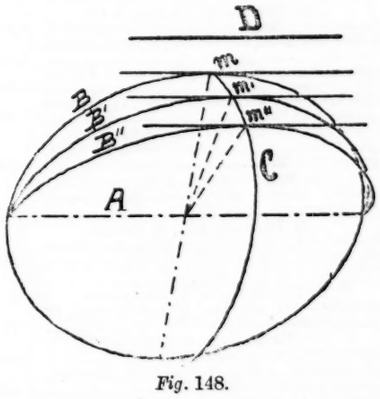


Fig. 148.

Shaping-machines.—9,410, G. Lowdon, Improvements in Locks.—9,413, W. Macrone, Improved Varnish or Size.—9,414, W. Macrone, Manufacture of Dry Colours.—9,417, J. Betts, Ventilation.—9,435, T. Jenkins and R. Perress, Improvements in Ventilators.

Aug. 8.—9,443, W. Fryer, New Spring Arrangement for Closing Doors, &c.—9,469, W. Macfarlane, Closets and Urinals.

Aug. 10.—9,494, J. Kent and E. Chabrel, Ascertaining Levels and Angles, &c., at a Glance.—9,519, C. Winn, Improvements in Water-closet Apparatus.—9,528, A. Gates, Improved Construction of Bakers' Ovens.

Aug. 11.—9,561, A. Wilkinson, Improved Construction of Ventilating Bricks.—9,577, W. Wise, Improved Lock.

PROVISIONAL SPECIFICATIONS ACCEPTED.

5,281, R. Wany, Fastenings for Window-sashes.—8,450, C. Watson, Fastenings for Window-sashes.—8,513, S. Rossiter, Weather-bar for Doors and Windows.—8,533, R. Harrison, Attaching Door-knobs to Spindles and Doors.—6,783, R. Bateman, Ventilation of Public Offices, Rooms, &c.—7,250, J. Broadhurst, Improved Pottery Kiln or Oven.—8,309, A. Rockwell and F. Davis, Sash-fasteners.—8,375, W. Lane, Chimney-pot or Smoke Ventilator.—8,385, R. Roberts, Blower for Domestic Fire-grates.—8,737, W. Lake, Improved Paint or Pigments.—8,873, J. Kellett, Drawing-board and Set-square.—7,252, J. Anderson, General Cabinet-makers' and Automatic Dovetailing Machines.—7,434, W. Brewer, Window Fasteners.—7,780, H. Campbell, Bench Vices.—8,026, J. Coulter, Machinery for Dressing or Planing Stone, Marble, &c.—8,753, A. Cooper and T. Harbord, Improvements in Cooking Ranges or Stoves.—6,844, F. Bosshardt, Metallic Paints.—7,066, E. and G. Warburton, Panel Planing and Thicknessing Machines.—7,124, E. Marland, Securing the Tops of House or other Chimneys.—7,995, H. Wakefield and A. Thomas, Locks or Latches.—8,029, A. Hartshorn, Sanitary Closet Pans, &c.—8,106, D. Miller, Cisterns for Flushing Water-closets.—8,259, J. Shanks, Improvements in Baths.—8,578, J. Banks, Door Checks.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

11,496, W. Russell, Improvements in Cooking and Kitchen Ranges, Stoves, or Grates.—12,644, R. Adams, Springs for Doors, and Checks for the Prevention of Slamming.—13,691, G. Nobes, Appliance for Supplying Disinfecting Fluid to Water-closets and Urinals.—13,817, F. Turner, Improvements in Flushing Tanks or Cisterns.—15,335, T. Ellis, Improved Domtstic Ventilator.—7,699, H. Haddan, Improvements in Windows.—13,036, T. Lumley, Combination Street Lamp-post, Letter-box, and Fire Alarm.—13,528, W. Paulson, Ventilating Rooms and Preventing Smoke.—13,845, D. Cowan, Cooking Ranges.—13,867, A. Boult, Manufacture of Paint.—15,266, A. Milne, Casement Stay for Securing French Casements and other Hinged Sashes.—12,019, W. Potts, Ventilating Apparatus.—12,761, C. Douglas, Locks and Latches and Adjusting and Securing Knobs and Handles to the Spindles of same.—13,472, H. Thompson, Construction of Stoves and Grates.—4,154, R. Best, Improvements in Chandeliers.—6,212, W. Mitford and G. Pettigrew, Joint for Water, Steam, Gas, Drain, or other Pipes.—7,125, R. Nisbet, Cooking Ranges.—13,350, J. Webb, Improvements in Kilns and Stoves.—13,477, J. Jex-Long, Apparatus for Dividing Timber.—14,010, H. Cooper, Manufacture of Portland Cement.—15,489, J. Fagan, Water-closet Cisterns.—7,938, A. Cram, Elbows for Stove Pipes.—8,088, J. Banks, Gully or Trap Grates.—8,365, C. Cowney, Closets, Urinals, &c.

The Student's Column.

DESCRIPTIVE GEOMETRY.—Part II.

XIII.

Find a plane, P, *tangent to a surface of revolution, and parallel to a plane,* Q, *given, and mark the point where the plane* P *is tangent.*

WE rotate the plane Q round the axis of the surface of revolution until the plane be perpendicular to the elevation; then we draw P^{1v} parallel to Q^{1v}, mark the point of tangence, m^1, and rotate back so as to get m^h and m^v. (See fig. 144.)

Find a plane, P, *tangent to a curved surface, either through a point a outside, or parallel to a line* D, *and mark the point,* m, *where the plane* P *is tangent.*

We have already seen that to cylinders and cones there are always two planes, P, tangent, either through a point outside their surface or in a direction parallel to a given line, such as a ray of the sun's light; but with curved surfaces, such as spheres, surfaces of revolution in general, ellipsoïds, &c., there are an infinite number of planes, P, tangent to their surface, as can be seen by our perspective sketches. (See figures 145 and 146.) In fig. 145, we see that through a point, *a*, exterior to the surface we can draw an infinite number of tangents to the surface, which, taken together, form a cone, of which the point *a* is the apex. Through every generator of that cone we can take a plane P, which will be at once both tangent to the cone and to the surface which the cone *circumscribes*. In fig. 146, where the planes P are required to be parallel to a given line, D, they would be tangent to a cylinder parallel to D, which *circumscribes* the surface; and again there are an infinite number of planes P tangent to a cylinder. In fact, both problems are identical, for the cylinder is, as we have said before, but a cone, the apex of which is infinitely distant.

There is a general method applicable to all surfaces for producing a plane, P, tangent to their surface and passing through a point *a* or parallel to a line D. Through the point *a* we take a number of planes which cut the surface and find the intersections B of these planes with the surface; then from *a* we draw tangents such as *a m* to the curves B; the series of points of contact *m* will form a line of contact C, along which the cone touches the surface; any plane containing a tangent to the curve C, and a generator of the cone will, of course, be one of the planes P required (see fig. 147). The same system applies when the planes P are required to be parallel to a line D. It suffices to take through the surface a line A parallel to D, and there all the planes passing through the line A will be parallel to D; to the section curves B we shall take parallels to A, and the curve of contact C will be that of a circumscribed cylinder. (See fig. 148.)

These curves of contact C *are of great importance to us, for they form the limit between light and shade,—in the one case, when objects are lighted by a candle; in the other case, when lighted by the sun's rays.*

There is another important property of the curve of contact C, to which we beg to call the attention of the reader. *The curve* C *is the outline of the surface seen in perspective when the eye of the spectator is placed in the point a, as in fig.* 145.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

AUG. 10.

By T. CHAMPNESS.

Chadwell, Essex—"Whalebone House," and 15 a., freehold £4,950

By WEATHERALL & GREEN.

East Tilbury—Tithe rent charges of £388 a year ... 5,700
"The Rectory House," and 30a. 2r. 20 p., freehold 1,900
"The Gravel Pit Farm," containing 42a. 2r. 23p. 1,050
"Tilbury House," 17a. 3r. 18p. freehold 1,250
Numerous enclosures of land, 126a. 0r. 37p., in seventeen lots 4,627

By OFFIN & Co.

Westminster Bridge-road — 21, Tower-street, 46 years, no ground-rent..... 290

By J. LEWIS & Co.

Mile-End—24, Edward-street, 79 years, ground-rent 4*l.* 10s..... 380
Woolwich—4 and 5, Clarendon-cottages, 48 years, ground-rent 6*l.* 6s. 300
West Ham — 78 to 84 even, Clarkson-street, 75 years, ground-rent 11*l.* 5s..... 430
Mile-End — 19, Paterson-street, 12 years, ground-rent 4*l.*... 110
Buckhurst-hil l— 1 to 4, Durham-villas, 80 years, ground-rent 20*l.* 800

By W. THORNTON.

Lingfield, near—Four enclosures of land, 15a. 3r. 23p. freehold 1,080
Three freehold cottages 200

AUG. 11.

By RELPH & SONS.

Bexley-heath—Four freehold cottages, and 2a. 0r. 25p. 1,775

By DEBENHAM, TEWSON, & Co.

St. James's—22, King-street, freehold, area 2,556 ft. 9,350
St. John's Wood—90, Carlton-hill, 50 years, ground-rent 35*l.* 4,100
Warnham, Sussex—"Cider Mill Farm," 29a. 1r. 39p., freehold 900
Kentish Town—57, Bartholomew-road, 73 years, no ground-rent 800

By ROGERS, CHAPMAN, & THOMAS.

Old Kent-road—320, Commercial-road, 23 years, ground-rent 4*l.* 285

By BEAN, BURNETT, & ELDRIDGE.

Shortlands, Kent — The freehold residence, "Coningsby" 1,450

By PHILLIPS, LEA, & DAVIES.

Forest-gate—73, Odessa-road, 68 years, ground-rent 2*l.* 10s..... 145

AUG. 13.

By INMAN, SHARP, & HARRINGTON.

Rotherhithe — 161 and 163, Abbeyfield-road, 69 years, ground-rent 1*l.*..... 790

By NEWBON & HARDING.

St. Giles's—22, Denmark-street, freehold 1,740
Upper Holloway — 207, Junction-road, 70 years, ground-rent 5*l.* 570
Islington—16 to 22 even, Barnsbury-street, freehold 2,510

By BRADSHAW BROWN.

Loughton—Copyhold residence in Victoria-place ... 400
Bow—1 to 8, Denbigh-terrace, freehold 2,000
Bromley-by-Bow—100 to 112 even, Bruce-road, 76 years, ground-rent 24*l.* 9s. 750
Nos. 1 to 5, Railway-cottages, 76 years, ground-rent 17*l.* 15s..... 530
Old Ford-road—433, 435, and 437, and 1, Autumn-street, freehold..... 740
Poplar—1, Pennyfields, freehold..... 290
Millwall—51, West Ferry-road, 58 years, ground-rent 6*l.* 10s..... 380
No. 209, West Ferry-road, 26 years, ground-rent 2*l.* 10s..... 260

By VENTOM, BULL, & COOPER.

Clapham—91 and 93, High-street, freehold 12,900
Borough—147, High-street, freehold..... 4,000

By E. STIMSON.

Brixton—30 to 36, Railton-road, 81 years, ground-rent 20*l.* 1,005
Wandsworth, Point Pleasant—Two houses, 83 years, ground-rent 20*l.* 200
Battersea—Ground-rents of 15*l.* 19s., reversion in 42 years 350
Lambeth—1 and 2, Little Paris-street, and ground-rents of 18*l.* 10s., 14 years, ground-rent 30*l.* ... 255
Camberwell—30, Leipsic-road, 19 years, ground-rent 4*l.*..... 275

By C. C. & T. MOORE.

Limehouse—47, Salmon's-lane, freehold 310
Old Ford—105, St. Stephen's-road, freehold 910
Bromley-by-Bow—66 and 68, Tetley-street, 57 years, ground-rent 4*l.* 5s. 370
South Hornsey—8 and 10, Cowper-road, freehold ... 585

By WILKINSON & SON.

Brighton—18 and 19, Clifton-road, freehold..... 1,450

AUG. 14.

By NORTON, TRIST, WATNEY, & Co.

Maida-hill—7, Warwick-road, 53 years, ground-rent 12*l.* 1,000

By BAKER & SONS.

High Barnet—The Corn Exchange, freehold 2,210

Miscellanea.

Public Baths at Bootle, near Liverpool. The Bootle Town Council on the 12th inst., adopted the recommendation of the Health Committee to award the first premium of 50*l.* for designs for their new baths to Mr. George Heaton, of Wigan,—motto, "Greater Bootle"; the second prize of 25*l.* to Mr. Samuel Jackson, of Bradford,—motto, "Choice A"; and the third prize of 10*l.* to Messrs. Smith, Woodhouse, & Chadwick, of Manchester,—motto, "Within the Limits." The estimated cost is 9,000*l.*

Incrustations on Bronze Statues.—Certain bronze monuments in Germany have not only failed to develope *patina*, but have been much disfigured by the appearance of stains. With a view to elucidate the sources of this disease of bronze, Professor Kaemmerer lately made a series of experiments upon stains which had marred the effect of the statues of Albert Dürer and Hans Sachs, at Nuremberg, of which the composition is as follows:—

	Dürer.		Sachs.
Copper	88·43	.....	88·88
Lead	4·72	.....	4·79
Arsenic	·86	.....	·76
Iron	·60	.....	·69
Tin	5·31	.....	2·39
Zinc	·11	.....	2·62

The results obtained disprove the assertion that zinc has an important part in the formation of such black incrustations, the statue of Dürer presenting more stains than the other. The normal components of bronze form but a slight proportion in these stains, which principally consist of foreign substances deposited on the surface of the bronze by wind, rain, smoke, and by birds. Amongst these substances are quartz, sand, clay, charcoal, sulphur, carbonic acid, water, ammonia, calcium, magnesium, iron, &c. After many trials cyanide of potassium was found the best dissolvent, the limited duration of its application and the subsequent washing preventing the corrosion of the metal underneath. It is incidentally remarked by the *Chemiker Zeitung* that the formation of *patina* is more dependent upon regularity and fineness of grain than upon the exact composition of the metal itself. Hence the mode of casting and the preparation of the moulds are points calling for particular attention in the creation of bronze statues.

The First Railway in America.—In a paper recently read before the Franklin Institute, on "Transportation Facilities of the Past and Present," Mr. Barnet Le Van corrects the commonly-received statement that the Granite Railroad, built at Quincy, Massachusetts, in 1827, by Gridley Byrant, for transporting stone for the Bunker-hill monument from the granite quarries of Quincy, was the first railway built in the United States. He presents evidence which proves that, far from being the first, the Granite Railroad was really only the fourth in order of precedence in the United States. The author, in dealing with this subject, states:—"Railroads were also first introduced in Pennsylvania. In September, 1809, the first experimental track in the United States was laid out by John Thomson (the father of John Edgar Thomson, who was afterwards the president of the Pennsylvania Railroad Company), civil engineer, of Delaware County, Pennsylvania, and constructed, under his direction, by Somerville, a Scotch Millwright, for Thomas Leiper, of Philadelphia. It was 60 yards (180 ft.) in length, and graded 1½ in. to the yard. The gauge was 4 ft., and the sleepers were 8 ft. apart. The experiment with a loaded car was so successful that Leiper in the same year caused the first practical railroad in the United States to be constructed for the transportation of stone from his quarries on Crum Creek to his landing on Ridley Creek, in Delaware County, Pennsylvania, a distance of about one mile. It continued in use for nineteen years. Some of the original foundations, consisting of rock in which holes were drilled and afterwards plugged with wood to receive the spikes for holding the sleepers in place, may be seen to this day.—*Iron.*

Newport (Mon.).—New Board schools at Crumlin have been opened for the use of 330 children, arranged in two departments, with master's house attached. Great difficulty was experienced in getting solid foundations to the schools and to the walls to the playgrounds, owing to the site being the bed of a former river, a large quantity of bog and slurry having to be excavated and carted away, to allow the foundations being taken to a solid stratum. The whole of the works have been carried out by Mr. Henry Parfitt, builder, of Pontnewydd, for the sum of 2,800*l.*, under the supervision of Mr. E. A. Lansdowne, of Newport, Mr. Ellis Williams, of Newbridge, acting as clerk of works.

Diocesan Surveyorship, York.—Mr. John W. Alexander, architect, Middlesbrough, was on the 13th inst. elected a surveyor under the Ecclesiastical Dilapidations Act, 1871, for the diocese of York, in place of Mr. Armfield, resigned.

Cae-Gurwen, Carmarthenshire.—The foundation stone of a Mission Church at the above place, to accommodate 200 worshippers was laid on the 12th inst. by the Rt. Hon. Lady Dynevor. The building consists of nave, chancel, north vestry, and south porch. The walls will be of local stone, plastered inside. The seats will be placed upon wooden platforms, and the nave, passages, porch, and chancel floored with Webb's Worcester encaustic tiles. The building will be heated by one of Porritt's underground stoves. The builder is Mr. C. Edwards, of Leominster, and the architect, Mr. E. H. Lingen-Barker, of Hereford.

Royal Exchange Assurance Building.—Messrs. Chubb & Sons ask us to mention that the safes indicated in the plan of this building, published last week, were made by them especially for the building.

Fire-bricks, &c.—Messrs. Goodman & Co., of Cumberland Wharf, E., have opened City offices at 72, Bishopsgate, E.C., where samples may be seen of fire-bricks, glazed bricks, blue bricks, drain-pipes, &c.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. .....ton	6 10 0	7 10 0
Teak, E.I. .....load	12 10 0	15 10 0
Sequoia, U.S. .....ft. cube	0 2 6	0 2 9
Ash, Canada .....load	3 0 0	5 0 0
Birch ,, ...	3 0 0	4 10 0
Elm ,, ...	3 10 0	5 0 0
Fir, Dantsic, &c.	1 10 0	4 10 0
Oak ,, ...	3 0 0	5 0 0
Canada	6 0 0	7 0 0
Pine ,, red	3 0 0	4 0 0
,, yellow	3 15 0	5 5 0
Lath, Dantsic .....fathom	5 0 0	6 0 0
St. Petersburg	5 0 0	7 0 0
Wainscot, Riga.....log	3 0 0	4 10 0
Deals, Finland, 2nd and 1st...std. 100	8 0 0	9 0 0
,, 4th and 3rd	6 10 0	7 10 0
Riga	7 0 0	8 10 0
St. Petersburg, 1st yel.	10 0 0	17 0 0
,, 2nd ,, ...	8 0 0	9 15 0
,, white	6 10 0	11 0 0
Swedish.....	7 0 0	17 0 0
White Sea	8 10 0	19 0 0
Canada, Pine 1st	18 0 0	32 10 0
,, 2nd	12 0 0	18 10 0
,, 3rd, &c.	7 0 0	10 10 0
,, Spruce 1st	9 0 0	12 0 0
,, 3rd and 2nd	6 10 0	8 0 0
New Brunswick, &c.....	5 0 0	7 10 0
Battens, all kinds	4 0 0	13 0 0
Flooring Boards, sq. 1 in.—Prepared, first	0 9 0	0 13 0
Second	0 7 6	0 8 6
Other qualities	0 5 0	0 7 0
Cedar, Cuba.....foot	0 0 3½	0 0 4
Honduras, &c.	0 0 3	0 0 4
Australian	0 0 3	0 0 3½
Mahogany, Cuba	0 0 5	0 0 7½
St. Domingo cargo av.	0 0 5½	0 0 7½
Mexican ,, ...	0 0 4	0 0 5
Tobasco ,, ...	0 0 4½	0 0 6½
Honduras ,, ...	0 0 4½	0 0 6½
Rose, Rio .....ton	7 0 0	17 0 0
Bahia.....	6 0 0	15 0 0
Satin, St. Domingo .....ft.	0 0 8	0 1 0
Porto Rico	0 0 8	0 1 3
Walnut, Italian	0 0 4	0 0 5

METALS.		
IRON—Pig in Scotland .....ton	2 1 6	0 0 0
Bar, Welsh, in London.....	4 15 0	5 2 6
,, ,, in Wales	4 7 6	4 12 6
,, Staffordshire, London	6 0 0	7 0 0
Sheets, single, in London.....	7 10 0	9 0 0
Hoops ,, ...	6 10 0	7 10 0
Nail-rods ,, ...	6 0 0	7 0 0
COPPER—		
British, cke. and ingt. .....ton	47 0 0	48 0 0
Best selected	48 0 0	49 0 0
Sheets, strong.....	55 10 0	56 0 0
,, India	52 10 0	53 0 0
Australian, fine cash.....	54 10 0	56 0 0
Chili, bars ,, ...	43 10 0	44 0 0
YELLOW METAL.....lb.	0 0 4½	0 0 4½
LEAD—Pig, Spanish	11 15 0	0 0 0
English, com. brands	12 5 0	0 0 0
SPELTER—		
Silesian, special .....ton	14 0 0	14 10 0
Ordinary brands	14 0 0	0 0 0
TIN—		
Straits	90 2 6	90 12 6
Australian	90 2 6	90 12 6
English ingots.....	93 0 0	0 0 0
TINPLATES—		
IC coke .....box	14 6 0	16 6 0
IX ditto	21 0 0	25 0 0
IC charcoal	17 0 0	20 0 0
IX ditto	26 0 0	27 0 0

OILS.		
Linseed .....ton	22 10 0	22 17 6
Cocoanut, Cochin	32 0 0	0 0 0
Ceylon	27 0 0	0 0 0
Copra.....	26 0 0	26 10 0
Palm, Lagos	29 10 0	30 0 0
Palm-nut Kernel	26 10 0	0 0 0
Rapeseed, English pale.....	25 10 0	26 0 0
,, brown	24 0 0	0 0 0
Cottonseed, refined	22 10 0	24 0 0
Tallow and Oleine	25 0 0	45 0 0
Lubricating, U.S.	7 0 0	10 0 0
,, Refined	8 0 0	15 0 0
TURPENTINE—		
American, in cks. .....cwt.	1 6 6	1 6 9
TAR—Stockholm .....brl.	1 2 0	1 2 6
Archangel.....	0 13 0	0 13 6

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Laying-out "Harold Tower" Grounds, Douglas, Isle of Man	Owners of "Harold Tower"	25*l*.	August 31st	i.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Painting, Tarring, &c., Bedford	War Department	*Official*	August 28th	ii.
Sanitary Improvements	Windsor Ryl. Infirmry	M. H. Judge	do.	xviii.
New Police-Station, Wanstead	Metro. Police District	*Official*	August 29th	ii.
Gasholder Tank	Oxford Gas & Coke Co.	T. & C. Hawksley	do.	ii.
Market Hall, Shops, and Dwelling-houses, &c.	Hull Corporation	W. A. Gelder	August 31st	ii.
Guernsey Granite	Gravesend U. S. A.	*Official*	do.	ii.
Corrugated-Iron Sorting Office	Com. of H.M. Works	do.	do.	ii.
(1.) Block of Buildings. (2.) Making-up, &c., Roads	Wandsworth Bd. of Wks	do.	Sept. 1st	ii.
Wooden Battery, Drill Shed, &c.	Admiralty	do.	Sept. 4th	ii.
Enlargement, &c., of Sewage-Purification Wks	Coventry Corporation	J. C. Melliss	Sept. 5th	xviii.
House and Shop, Kilburn		E. Monson, Jun.	Sept. 8th	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Inspector of Nuisances	Wandsworth Bd. of Wks	109*l*. 4s., &c.	Sept. 5th	xvi.

TENDERS.

ASHBY-DE-LA-ZOUCH.—For restoring, re-seating, lighting, and ventilating Holy Trinity Church, Ashby-de-la-Zouch, including hot-water apparatus and fittings. Mr. W. T. Hampton, architect, Loughborough. Quantities by Mr. Robey E. Carpenter, Burton-on-Trent:—

Messenger, Loughborough	£1,506 0 0
Stevenson, Burton	1,359 0 0
Noon & Son, Hilton	1,325 0 0
Lowe & Sons, Burton	1,258 6 0
Fish, Ashby	1,189 11 0
Harvey, Newhall	1,104 3 0
Black, Barrow	1,074 0 0
Needham, Longhborough*	1,031 13 6

* Accepted, subject to reductions.

BROCKLEY.—For the erection of a residence for Capt. Harvey. Mr. Richard Peters, architect, Wool Exchange, Coleman-street:—

Richardson Bros.	£1,688 0 0
Sayers	1,675 0 0
Watson	1,350 10 0
Kemp	1,350 0 0

BROMLEY-BY-BOW.—For painting and decorative repairs to the Vestry-hall, Bow-road, for the Churchwardens and Overseers. Messrs. A. & C. Harston, architects, 15, Leadenhall-street. Quantities not supplied:—

Brown, Kruse, & Co.	£650 0 0
Cocks & Co., Frederick's-place, Mile End (accepted)	525 0 0

BROMLEY-BY-BOW.—For erecting new mineral water manufactory, stabling, and offices, to be called "The Priory Steam Works," Priory-street, Bromley, for Mr. T. R. Watts. Mr. G. T. Tribe, architect. Quantities by Mr. James F. Wesley:—

Gentry	£2,960 0 0
Curtis & Sons	2,885 0 0
Taylor	2,759 0 0
Shurmur (too late)	2,754 0 0
Everard	2,722 0 0
Hughes	2,700 0 0
Walker	2,700 0 0
Atherton & Latta	2,699 0 0
Holland	2,693 0 0
Harris & Wardrop	2,659 0 0
J. H. Johnson	2,631 0 0
Perry & Co.	2,598 0 0
Palmer & Co.	2,565 0 0
Barnes	2,482 0 0

COLCHESTER.—For offices in Crouch-street, Colchester, for Mr. E. J. Sanders. Mr. F. E. Morris, architect:—

G. Dobson	£283 0 0
C. H. Oldridge	273 0 0
H. Everett & Son	269 0 0
F. Dupont (accepted)	263 0 0

[All of Colchester.]

COLCHESTER.—For converting private house in Crouch-street, Colchester, into two shops, for Mr. D. Prior. Mr. Horace Darkin, architect:—

G. Dobson	£250 0 0
F. Dupont	235 0 0
C. H. Oldridge (accepted)	215 0 0

Painting and Decorating.

W. Rogers (accepted)	£90 0 0

[All of Colchester.]

DARTMOUTH.—For alterations and repairs to premises, Clarence-street, Dartmouth, for Mrs. Ladd. Mr. E. H. Back, architect, Dartmouth. Quantities supplied:—

B. Williams	£262 0 0
H. Winsor	247 0 0
E. J. Henley (accepted)	210 0 0

[All of Dartmouth.]

DARTMOUTH.—For alterations and repairs to premises, Bayard's Cove, Dartmouth, for Miss Stone. Mr. E. H. Back, architect, Dartmouth:—

E. J. Henley	£78 0 0
F. Maunder	65 0 0
H. Winsor	58 0 0

[All of Dartmouth.]

DARTMOUTH.—For alterations to the Guildhall, Dartmouth, for the Town Council. Mr. E. H. Back, Borough surveyor. Quantities supplied:—

H. Veale	£146 10 0
H. Winsor	143 15 0

[Both of Dartmouth.]

[Surveyor's estimate £146 15s. 9d.]

DARENTH (Kent).—For repairs to oak fencing round the estate belonging to the Managers of the Metropolitan Asylum District. Messrs. A. & C. Harston, architects, No. 15, Leadenhall-street. Quantities not supplied:—

Barnes & Co.	£294 0 0
S. Riches	274 10 0
Beadle Bros.	184 0 0
W. H. Martin	175 13 0
J. Wood	165 0 0
J. O. Curtis	144 5 8
M. Marshall	140 0 0
A. Cook	114 0 0
G. Law, 112, Week-street, Maidstone*	89 0 0

* Accepted.

DARENTH (Kent).—For painting and other works at the Asylum for Imbeciles, Darenth, Kent, for the Managers of the Metropolitan Asylum District. Messrs. A. & C. Harston, architects, 15, Leadenhall-street. Quantities not supplied:—

E. P. Palmer	£327 0 0
W. Dudley	270 0 0
E. Proctor, Wellington-street, Woolwich (accepted)	260 0 0

FOREST-HILL.—For additions and alterations to Tewkesbury Lodge, Forest-hill, for Mr. A. Richards. Mr. Frank T. Baggallay, architect. Quantities by Mr. Edwin Pink:—

T. Roberts	£3,520 0 0
R. L. Wood	3,390 0 0
J. & C. Bowyer	3,193 0 0
Redman	3,075 0 0
Candler	3,030 0 0
J. C. Arnaud & Son	2,988 0 0

HANWELL.—For building piggeries at the Central London District School, Hanwell, for the Board of Management. Mr. Arthur G. Langdon, architect, Craven-street:—

T. Riches	£589 0 0
T. Lingfield	509 0 0
J. W. Cowland	444 12 0
G. Gibson	384 0 0
H. Haynes	370 0 0
A. & E. Addis	350 0 0
Neave & Neave	344 0 0
T. Nye	338 15 0
W. Brown	330 0 0
A. Clissold*	310 0 0

* Accepted, subject to references proving satisfactory.

HORNSEY.—For the making-up of Harold-road, Hornsey, for the Hornsey Local Board. Mr. T. De Courcy-Meade, engineer and surveyor:—

Williamson, Green Lanes	£210 0 0
Dunmore, Crouch End	169 0 0
Heard, Hoxton	160 0 0
Nicholls, Wood Green	151 0 0
Aspinall & Son, Hoxton	150 0 0
Jackson & Son, Finsbury-park	145 0 0
Marshall, Brighton	144 0 0
Pizzey, Hornsey	143 0 0
Mowlem & Co., Westminster	134 0 0
A. Walker, Upper Holloway*	129 0 0

* Accepted.

HENLEY.—For the execution of sewerage works on the Shone Hydro-pneumatic System, at Henley. Mr. Issac Shone, engineer, Westminster-chambers, London:—

Contracts Nos. 1, 2, and 4.—Sewers, Iron Mains, and Buildings.

J. Jackson, Westminster	£10,467 5 7
G. Munday & Son, London	10,252 10 3
W. J. Botterill, London	9,823 0 0
Beadle Bros., Erith	9,508 16 7
H. Young & Co., Pimlico	9,434 0 0
H. R. Trehearne & Co., Battersea	9,234 0 0
G. Gibson, Southall	9,187 17 11
W. Neave & Son, Paddington	9,075 0 6
J. W. & J. Neave, Leytonstone	9,029 17 3
S. & E. Collier, Reading	8,560 3 1
G. Bell, Tottenham	8,447 18 3
J. W. Pickthall, Southampton	8,427 0 10
T. D. Ridley, Harwich (accepted)	8,253 1 0
B. Cooke & Co., Battersea	7,781 13 0

Contract No. 3.—Air-compressing Machinery.

H. R. Trehearne & Co., Battersea	£3,535 0 0
H. Young & Co., Pimlico	3,485 0 0
J. Warner & Sons, London	3,400 0 0
G. Scott & Son, London	3,348 0 0
Waller Bros., Wigan	3,200 0 0
Warsop & Hill, Nottingham	3,082 0 0
G. Waller & Co., London	3,010 0 0
E. Thompson, Leeds	2,987 15 0
Causer, Smith, & Co., Birmingham	2,964 0 0
J. Slee & Co., Earlestown, Lancashire	2,600 0 0
Thornewill & Warham, Burton-on-Trent	2,565 0 0
F. Silvester & Co., Newcastle, Staffordshire	2,370 0 0
Coalbrookdale Co., Shropshire	2,285 0 0
John Fowler & Co., Leeds	2,217 0 0
Pearce Bros., Dundee	2,200 0 0
W. & J. Yates, Blackburn	2,103 0 0
Grange Iron Co., Durham	2,075 0 0
Hartley & Arnoux Bros., Stoke-on-Trent	2,070 9 6
Galwey, Bainbridge, & Co., Warrington	2,064 0 0
Hughes & Lancaster, Chester*	2,053 0 0
G. Kirk & Co., Stoke-on-Trent	2,021 0 0
Pratchitt Bros., Carlisle	1,997 0 0
J. Wolstenholme, Radcliffe, Lancashire	1,935 0 0

* Accepted.

HULL.—For the erection of warehouse buildings between High-street and the River Hull, for Messrs. John Bilton & Co. Messrs. Botterill, Son, & Bilson, architects. Quantities by the architects:—

T. D. Ridley, Middlesbrough	£29,939 5 3
H. Grassby, Hull	27,155 14 9
J. T. Skinner, Hull	26,888 5 0
J. & W. Beanland, Bradford	26,471 0 0
J. Drury, Hull	26,248 0 0
M. Harper, Hull	25,910 0 0
Armitage & Hodgson, Leeds	25,625 0 0
G. Jackson & Son, Hull (accepted)	23,250 0 0
A. W. Stanley, Hull (withdrawn)	22,593 10 0
B. Musgrave, Hull (withdrawn)	22,534 0 0

For Cast-iron Columns for the same Buildings.

T. D. Ridley, Middlesbrough	£4,705 0 0
J. Abbot & Co., Gateshead	4,357 10 1
A. Handyside & Co., Derby	4,307 13 0
T. & W. Bradley, Newark	3,776 0 0
J. Butler, Stanningley, Leeds	3,768 10 0
York Engineering Co.	3,709 5 0
Newton, Chambers, & Co., Sheffield	3,650 11 0
King & Co., Hull (accepted)	3,597 14 0

KENSINGTON.—For the erection of a new chapel at the Mall, Kensington, for the Trustees. Messrs. T. Chatfeild Clarke & Son, architects. Quantities by Messrs. Leonard & Clarke:—

	A.*	B.†	C.‡
Mowlem & Co.	£13,683	£1,893	£ 888
Peto Bros.	13,309	2,180	1,086
Clarke & Bracey	12,987	1,529	825
Holland & Hannen	12,900	1,610	925
Dove Bros.	12,900	1,710	866
Brown, Son, & Blomfield	12,500	2,250	920
E. Lawrance & Sons	12,450	1,467	809
J. Morter	12,339	1,613	537
B. E. Nightingale	12,278	1,658	954
Bywaters	11,980	2,241	1,170
Colls & Sons	11,620	1,705	689
Hall, Beddall, & Co.	11,597	1,747	814
J. T. Chappell	11,211	1,699	717

* Church and tower.

† Lobbies and pews if in wainscot.

‡ Lobbies and pews if in pitch pine.

KENSINGTON.—For the erection of a minister's house adjoining the Mall Chapel, Kensington, for the Trustees. Messrs. T. Chatfeild Clarke & Son, architects. Quantities by Messrs. Leonard & Clarke:—

Bywaters	£2,857 0 0
Peto Bros.	2,849 0 0
J. Morter	2,827 0 0
Clarke & Bracey	2,810 0 0
Dove Bros.	2,800 0 0
Holland & Hannen	2,780 0 0
Mowlem & Co.	2,778 0 0
Colls & Sons	2,777 0 0
Hall, Beddall, & Co.	2,713 0 0
Brown, Son, & Blomfield	2,700 0 0
B. E. Nightingale	2,651 0 0
E. Lawrance & Sons	2,640 0 0
J. T. Chappell	2,537 0 0

KENSINGTON.—For making up carriage-way of Lexham-gardens, for the Kensington Vestry. Mr. William Weaver, surveyor:—

G. Felton, Iverson-yard, Iverson-road (accepted)	£174 0 0

KILBURN.—For constructing a 3 ft. 9 in. by 2 ft. 6 in. brick sewer in Pembroke-road, Kilburn, for the Willesden Local Board. Mr. O. Claude Robson, engineer:—

G. Felton, Iverson-yard, Iverson-road (accepted)	£633 0 0

LEEK.—For rebuilding frontage, &c., of shop premises in Derby-street, Leek, for Mr. Peter Magnier. Messrs. W. Sugden & Sons, architects:—

T. Grace (accepted)	£330 0 0
J. Hudson (accepted)	159 0 0
C. Phillips (accepted)	95 0 0

LEYTONSTONE.—For alterations and improvements in the sanitary arrangements of infirmaries and receiving wards of the Schools at Leytonstone belonging to the Bethnal-green Guardians. Messrs. A. & C. Harston, architects, 15, Leadenhall-street. Quantities not supplied:—

Stidder & Co.	£815 0 0
Jackson & Todd	726 0 0
J. Knight, Marsham-street, Westminster (accepted)	637 17 0

LONDON.—For sundry alterations and additions to Essex-street Chapel, Strand, for the Trustees. Messrs. T. Chatfeild Clarke & Son, architects. Quantities by Messrs. Leonard & Clarke:—

J. D. Hobson	£8,535 0 0
Grover & Son	7,685 0 0
J. Woodward	7,400 0 0
Hall, Beddall, & Co.	7,360 0 0
J. & J. Greenwood	7,325 0 0
Adamson & Sons	7,240 0 0
Macey & Sons	7,117 0 0
B. E. Nightingale	6,980 0 0
Patman & Fotheringham	6,943 0 0
Killby & Gayford	6,933 0 0
J. T. Chappell	6,741 0 0

LONDON.—For erecting a second portion of coach factory for Messrs. Thrupp & Maberly, Oxford-street. Mr. Henry S. Legg and Mr. Arthur Kinder, architects:—

Woodbridge	£6,995 0 0
Cowland	6 851 0 0
Bird	6,439 0 0
Brass	6,273 0 0
Waterman	6,196 0 0
Stiff	6,185 0 0
Elliott	6,119 18 2
Dove	5,845 0 0
Kingdon & Tompsett	5,545 0 0
Perry	5,485 0 0

LONDON.—For sanitary works and general repairs to the St. James's baths and washhouses, Marshall-street, Golden-square, for the Commissioners. Mr. Henry Monson, surveyor:—

Scrivener	£1,200 0 0
Foxley	1,197 0 0
McIntosh	1,070 0 0
Braid	920 0 0
Knight, Westminster	875 0 0
Beach (accepted)	740 0 0

LONDON.—For rebuilding 1 and 2, Whitfield-place, Tottenham Court-road, for Mr. T. J. Phillips. Mr. W. H. Woodroffe, architect, 18, Great Dover-street:—

Feltham Bros.	£1,647 0 0
Larke & Son	1,590 0 0
Outhwaite & Son	1,494 0 0
W. Downs	1,432 0 0
W. & F. Croaker (accepted)	1,378 0 0

LONDON.—For alterations and additions to the Working Men's Mission Hall, Collingwood-street, Blackfriars. Mr. R. H. Hill, architect:—

Craske	£658 0 0
Creer	567 0 0
Harris & Wardrop	533 0 0
J. C. Arnaud & Son	525 0 0

LONDON.—For alterations to 262 and 264, Edgware-road. Mr. Robert Willey, architect, Ludgate-hill:—

W. Rhodes, Hyde Psrk	£865 0 0
J. Woodward, Finsbury	850 0 0
Penny & Durrant, Ealing	780 0 0
Jones & Sons, Ealing	746 10 0

LONDON.—For decorations and repairs to No. 71, Eastcheap, London, for Messrs. Lough Bros. Mr. Richard Peters, architect, Wool Exchange, Coleman-street:—

Pritchard	£50 0 0
Richardson Bros.	43 0 0
Kemp (accepted)	36 0 0

NEWHALL.—For Newhall Catholic Church, for the Countess of Loudoun, Wellesley Hall, Ashby-de-la-Zouch. Mr. W. T. Hampton, architect, Loughborough. Quantities by Mr. Robey E. Carpenter, Burton-on-Trent:—

Beckwith & Sons, Whitwick	£1,130 0 0
Needham, Loughborough	1,119 0 0
E. Earp, Newhall	1,068 0 0
J. & C. Hunter, Burton	1,028 0 0
W. Earp, Newhall	1,021 0 0
H. Slater, Ashby	1,012 0 0
J. Slater, Woodville	999 0 0

ROTHERHITHE.—For the erection of Chapel at Rotherhithe. Mr. W. Ranger, architect:—

Mower	£749 0 0
Scholfield	740 0 0
Higgs	730 0 0
Bullers	675 0 0
Green Bros.	650 0 0
Richardson	648 0 0
White & Co.	637 0 0
Chafen	625 0 0
Allen & Sons	594 0 0
Holloway	593 0 0

RUISLIP.—For the erection of four cottages at Ruislip, Middlesex, for Mrs. John Ewer, of Southall. Mr. Thomas Newell, architect, New Broad-street:—

Moore	£959 0 0
Kearley	858 0 0
Brown & Son	675 0 0
Quinion (accepted)	640 0 0

SOUTHALL.—For alterations and additions to house in Western-road, Southall, Middlesex, for Mr. George McDonald, M.D. Mr. Thomas Newell, architect, New Broad-street:—

A. & B. Hanson, Southall*	£1,117 0 0

* Accepted.

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Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [Advt.

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